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ABSTRACT

To further understanding of the process through which occupational careers are formed, this study analyzed life histories to determine job-shifts undertaken by a cohort of men 30-39 years of age. It was proposed that individuals will decide to leave a job when they perceive that a gain in achievement is possible. The analysis of the outcome of job shifts revealed that gain in prestige and income are determined by the achievement of the job left and a person's resources (education, family background, and ability), with the most important resource being the individual's education. It was also demonstrated that such structural constraints as level of employment and distribution of job opportunities may be measured by the amount of variance explained in the prestige or income of the job entered. Finally, it was shown that the level of achievement increases with age and that the covariance between resources and achievement also increases. (Author/SB)

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THE OCCUPATIONAL MOBILITY PROCESS: AN ANALYSIS OF OCCUPATIONAL CAREERS

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Aage B. Sørensen

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INTRODUCTORY STATEMENT

The Center for Social Organization of Schools has two primary objectives: to develop a scientific knowledge of how schools affect their students, and to use this knowledge to develop better school practices and organization.

The Center works through five programs to achieve its objectives. The Academic Games program has developed simulation games for use in the classroom. It is evaluating the effects of games on student learning and studying how games can improve interpersonal relations in the schools. The Social Accounts program is examining how a student's education affects his actual occupational attainment, and how education results in different vocational outcomes for blacks and whites. The Talents and Competencies program is studying the effects of educational experience on a wide range of human talents, competencies, and personal dispositions in order to formulate -- and research -- important educational goals other than traditional academic achievement. The School Organization program is currently concerned with the effects of student participation in social and educational decision-making, the structure of competition and cooperation, formal reward systems, effects of school quality, and the development of information systems for secondary schools. The Careers and Curricula program bases its work upon a theory of career development. It has developed a self-administered vocational guidance device to promote vocational development and to foster satisfying curricular decisions for high school, college, and adult populations.

This report, prepared as part of the Social Accounts program, examines occupational transitions in order to better understand how occupational careers are formed.

2

Abstract

This study analyzes occupational transitions undertaken by a cohort of men 30-39 years of age. The data were obtained from a study of the life histories of a sample of this cohort. The analysis of job-shifts was undertaken in order to better understand the process through which occupational careers are formed. Occupational careers -- the variation over age in prestige and income -- are the outcomes of job shifts, insofar as all major variation in prestige and income occurs through job shifts. The level of prestige and income at a given age then is determined by the frequency and outcome of job shifts.

Job shifts are seen as undertaken by individuals attempting to maximize their occupational achievement. The possibilities for gaining prestige and income are determined by a person's level of resources -- his education, family background and ability. A person's attempts to maximize achievement are constrained by structural characteristics such as the level of employment and the distribution of job opportunities.

The first part of the dissertation analyzes the decision to leave a job. The dependent variable in this analysis should be the probability of leaving a job.

A serious obstacle for the formation of this variable, however, is the age dependency of the probability of leaving. A mathematical model is suggested that eliminates the age dependency by transforming time (age) into a new time scale -- psychological time.

It follows from the proposed theory of careers that individuals will decide to leave a job when they perceive that a gain in achievement is possible. Therefore, given the level of achievement already obtained, the higher the level of resources, the more likely a job shift. Conversely, given the level of resources, the higher the prestige and income already obtained, the less likely a job shift. These implications were verified in the analysis. It is also shown that structural constraints determine the amount of variance explained by individual characteristics in the probability of leaving a job.

The analysis of the outcome of job shifts shows that gain in prestige and income are determined by the achievement of the job left and a person's resources. The most important of the resource variables is the education of the individual. It is demonstrated that structural constraints may be measured by the amount of variance explained in the prestige or income of the job entered. Finally it is shown that the level of achievement increases with age and that the covariation

between resources and achievement also increases. This result reflects the fact that the mean gain in job shifts is possitive and a function of a person's resources.

Acknowledgments

This dissertation is based on a study of life-histories of 30-39 year old men. The study is part of a larger research program entitled "The Social Accounts Program," initiated by James S. Coleman and Peter H. Rossi, both of the Department of Social Relations, The Johns Hopkins University. Zahava D. Blum, and, in the earlier parts of the study, James M. McPartland, were also major participants in the study.

James S. Coleman was the primary advisor on the dissertation. I am deeply indebted to him for his personal and intellectual generosity. He provided the main inspiration for the study and his numerous ideas and suggestions affected every part of the dissertation. Peter H. Rossi also gave many valuable suggestions and generously assisted in many parts of the study.

Zahava D. Blum is in large measure to be credited for the successful completion of such a difficult endeavor as a life-history study. In numerous ways she contributed to the completion of the present analysis. Nancy Karweit solved many of the basic problems in the handling of life history data, and provided a nice environment in the many hours at the computer center. Page Clark gave valuable assistance in the final part of the analysis.

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TABLE OF CONTENTS

Abstract ii

Acknowledgements v

Chapter I - Introduction 1

Conceptualization of Mobility 2

Objective of Mobility Research 3

Problem Areas in Mobility Research 5

Chapter II - Objectives and Method of Analysis 13

Data: The Retrospective Life-History Study 13

Objectives 15

Method of Analysis 17

Outline of the Study 24

Chapter III - The Decision to Leave a Job 26

A Model for the Probability of Leaving a Job 26

Determinants of Job Shift 39

Results 45

Conclusion 56

Chapter IV - Returns on Job Transitions 59

A Model In Returns for Job Shifts 59

Determinants of Returns on Job Shifts 67

Gains in Prestige and Income and Their Relation To Individual Characteristics 68

Level of Occupational Achievement 85

Impact of Structural Characteristics 92

Conclusion 101

Chapter V - Summary and Conclusion 105

Summary 105

The Achievement Process as a Social Indicator . . . 111

Concluding Remarks 114

Figures and Tables 117

References 135

Appendix A A-1

FIGURES AND TABLES

Figure 3.1 - Proportion of Individuals Remaining in Job After s Months as a Function of Age 117
Figure 3.2 - Duration of Job as a Function of Age 118
Table 3.1 - Estimates of Y in the Equation 3.16 for Different Values of s 119
Table 3.3 - Summary of Regression of Probability of Leaving a Job on Occupational Achievement and Characteristics of the Job-Holder 120
Table 3.4 - Summary of Regression of Probability of Leaving a Job for Persons Who Stated They Did, Versus Did Not, Leave Job on Tehir Own Decisions . . 121
Table 3.5 - R^2's from Regression of Probability of Leaving in Different Industries and Unemployment Rates 122
Table 4.1 - Summary of Regression of Gains in Prestige on Characteristics of the Job-Holder 123
Table 4.2 - The Relative Effect of Various Resource Variables on Gains in Prestige According to Three Alternative Measures of Effect 124
Table 4.3 - Summary of Regression of Gains in Income on Characteristics of the Job-Holder 125
Table 4.4 - The Relative Effect of Various Variables on Gains in Income According to Three Alternative Measures of Effect 126
Table 4.5 - Canonical Analysis of Gains in Prestige and Income 127
Table 4.6 - Summary of Regressions of Income and Prestige Level on Individual Characteristics 128
Table 4.7a - Regression of Prestige on Individual Characteristics in Three Age Groups 129
Table 4.7b - Regression of Income on Individual Characteristics in Three Age Groups 130

FIGURES AND TABLES CON'T

Table 4.8 - Mean Prestige and Income and Mean Gains in Prestige and Income According to Stated Control over the Decision to Leave 131

Table 4.9 - Raw Regression Coefficient of Income and Prestige of Job Left on Gains in Achievement According to Stated Control over the Decision to Leave Job 132

Table 4.10 - Amount of Variance Explained by Prestige and Income of Job Left and Resources, by Stated Control over the Decision to Leave Job 133

Table 4.11 - Canonical Correlations between Prestige and Income at Job Entered and Individual Characteristics and Prestige and Income of Job Left in Different Industries and Unemployment Rates 134

INTRODUCTION

This study is an attempt to use life-history data in an analysis of social mobility. Life history data are longitudinal records of events in a person's life cycle. The data used here are from a cohort of 30-39 year-old men, who reside in the U.S. The life histories give detailed information on educational, occupational and family histories from age 14 to the date of interview. We know, for this sample of men, when they left school, their educational attainment, what jobs they have held, when they got married and how many children they had. With these data we can describe and analyze events within a single sphere of activity, such as job-histories, and the interrelationships between spheres of activity, such as the effect of marriage on educational activity. Most important, we have the opportunity to study the time dependency of phenomena and to analyze how changes were brought about.

Empirical research on social mobility has a long-standing tradition in sociology. There are many studies of social mobility from a variety of societies.[1] Most studies are on father-son or intergenerational mobility, and no studies have used life history data in the analysis of intragenerational mobility. The problem of measuring mobility has attracted considerable methodological interest, resulting in a legion of measures, models and indices. Theoretical attention to the problems of social mobility has been scant, however, although there seems to be common agreement on the conceptualization of mobility.

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[1] For a survey of the literature, see for example, Miller (1960).

To see how life-history data may be important in mobility research, we shall outline how social mobility may be conceptualized, the major objectives of mobility research, and the major problems that are encountered in attempting to achieve these objectives. No comprehensive survey is intended. Rather we shall highlight some of the problems which the use of life history data may help solve. These are important problems in mobility research, but they cannot be claimed to be the only ones.

1.1 Conceptualization of Mobility

A distinction between positions in social structure and the individuals occupying these positions is basic to the conceptualization of mobility. With this distinction, mobility is defined as movement of individuals between positions. Most often these positions are jobs, classified into occupational groups and economic industries.

The movement of individuals between jobs or positions can be characterized by speed and by direction. One way to achieve this characterization is to express mobility as a probability that an individual will move from one occupation to another within a given period of time. Two major sets of forces -- characteristics of the individual, and characteristics of the occupational structure -- are responsible for the variation in this probability, and thus for the speed and direction of mobility. Education, age, race, and family background are examples of variables that are frequently used to characterize the individual. The distance or affinity between occupational groups, and the supply of jobs in the occupations of origin and destination, are relevant characteristics of the occupational structure.

Formally, this conceptualization of mobility can be expressed in a heuristic equation for the probability that individual $\underline{v}$ moves from occupation $\underline{i}$ to occupation $\underline{j}$ in a time period, $\underline{t}$:

$$P_{ij}^{v}(t) = f(a_v,\ b_i(t),\ c_j(t),\ d_{ij}) \tag{1.1}$$

where $\underline{a}_v$ stands for individual characteristics relevant to the amount and direction of mobility. The parameters $\underline{b}_i$ and $\underline{c}_j$ stand for the supply of jobs in the occupations of origin and destination, relative to the demand for these jobs -- and thus measure the pressure to leave an occupation and the availability of jobs in that occupation. The affinity or distance between occupational groups is expressed by the parameter $\underline{d}_{ij}$. Of these variables, at least $\underline{b}_i$ and $\underline{c}_j$ must be assumed to functions of time, since they are dependent on past mobility trends.

1.2 Objectives of mobility research

Equation (1.1) represents a list of the main factors responsible for the amount and direction of social mobility. As such, it expresses a theory of mobility only on the most general level. More specific formulations of the interrelationships among the variables and more precise and meaningful definitions are necessary in order to use this conceptualization in research. The objective of the study, of course, will determine which of the factors in equation (1.1) are emphasized. Among the multitude of purposes of mobility research, two major classes may be identified. One general aim is to predict and/or explain occupational achievement; another is to study mobility as a characteristic of social systems.

The study of occupational achievement emphasizes the direction of movement in terms of the prestige or income of a job. Prestige or income changes are examined in relation to individual characteristics such as family background, education and other personal resources, and the objective is to explain income and prestige differences among individuals. In the study of mobility as a system characteristic, the emphasis is on the amount of movement between occupational categories or industries in relation to characteristics of the occupational structure and changes in these characteristics, and the objective is to explain differences among social systems in the amount of mobility.

An outstanding example of social mobility research which may be classified as a study of occupational achievement is Blau and Duncan's (1967) analysis of the importance of family background and education for occupational status. Lipset and Bendix's (1959) comparative analysis of mobility rates in industrialized societies is an example of the study of mobility as a characteristic of social systems.

The identification of two sets of objectives should not conceal the fact that a major proportion of studies are not easily classified under either heading, and that a majority are descriptive rather than explanatory.

With this brief outline of the definition of mobility and the major objectives of mobility research, we may identify some of the obstacles to the achievement of these objectives.

1.3 Problem areas in mobility research

When the objective of a mobility study is not purely descriptive, some important theoretical and methodological problems arise. There are two major problem areas: 1) problems in arriving at suitable measures and models of mobility; and 2) theoretical problems of specifying and explaining the relationships among the various factors relevant for mobility. Both sets of problems should be seen against the background of the properties of the data used in mobility research. It therefore seems appropriate to outline some important limitations of mobility data before further describing the two problem areas.

Limitations of intergenerational mobility data

The data most often used in mobility research are, as mentioned, data on father-son mobility gathered on a representative sample of men in a community or nation.

There is no doubt that this state of affairs reflects the fact that father-son mobility is culturally defined as the crucial indicator of the "openness" of a society. However, the general definition of mobility presented above does not imply father-son mobility as the only phenomenon of interest. Also, the objectives of mobility research do not demand the use of intergenerational data.

Intergenerational data usually have three kinds of limitations. First, they give only two observations on the mobility process for each individual (if the father is taken as the son's starting point), and these two observations are widely separated in time. Second, intergenerational data typically only give information on mobility itself and very little information on relevant individual and structural characteristics. Third, with such data, the mobility process is not very well specified with respect to time: even if the generation of sons is a well-defined cohort, and their occupational distribution therefore precisely located in time, the generation of fathers is not well-defined and cannot in general be so (Duncan, 1966). Thus it will not be known with any precision when a shift between occupational categories took place. This lack of precise time reference makes it difficult, if not impossible, to relate characteristics of social and occupational structure to the amount and direction of mobility, since such structural characteristics of society must be assumed to change over time. In general the limited information offered by intergenerational data seems to preclude any but the most gross analysis of variations in mobility.

Methodological problems

There is a lack of satisfactory measures of mobility that are pertinent to the conceptualization of mobility and the objectives of mobility research. In general the methodological problem is that existing measures do not adequately separate out the various components responsible for mobility.[1] Some examples may serve to clarify the consequences.

In the analysis of occupational achievement, the methodological problem is the impossibility of separating out the relative importance of structural and individual factors. This means that the importance of education for occupational achievement cannot be compared from one society to another, when these societies vary with respect to availability of jobs at different occupational levels. When it is impossible to compare the relative importance of structural and individual variables for occupational achievement, it is not possible to project the impact of, for example, a change in the educational level of blacks on their occupational achievement -- unless one is willing to base the prediction on the assumption that no change will occur in the occupational structure. This defect of existing techniques of analysis may have serious consequences for the use of mobility research in social policy.

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[1] A more extensive review and critique of measures and models of mobility can be found in Sørensen (1971).

In the analyses of mobility as a characteristic of social systems, it is desirable not only to separate individual from structural causes of mobility, but also to measure the various structural factors separately. To compare the "openness" of social systems over time or between places, it would be necessary to measure how the amount of mobility relates to changes in the availability of jobs and to variations in the affinity or distance between occupational groups. Existing measures do not do a completely satisfying job. Most attention has been focused on the development of a satisfactory measure of distance or affinity between occupational groups. One index, the mobility ratio, has been used extensively.[1] This measure has defects when used to compare mobility in two different occupational structures (Duncan, 1966), an unfortunate fact in view of the objectives of much research with the index. In addition, the measure does not adequately take into account the variation in characteristics of occupation of origin and destination -- a property it shares with other measures of distance.

The povery of information offered by intergenerational data seems to be very important for the difficulties encountered in establishing measures and models of mobility. Father-son mobility data usually are presented in a single turn-over table. This table then provides all the information available for an attempt to separate out the various factors listed in equation (1.1). This is in itself difficult, and it demands, if at all possible, that the data show a definite structure. But to show a definite structure, a high degree of measurement precision is necessary, and intergenerational data ordinarily lack such precision.

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[1] This index was introduced independently by Bressard (1950), Rogoff (1953), and Glass (1954).

Theoretical problems

Theories of social mobility have played a small role in the sociological research tradition. Sorokin (1927) formulated the basic ingredients in the conceptualization of mobility, and derived a set of propositions on variations in mobility over time or between societies. He also introduced a set of commonly-used terms and distinctions (vertical and horizontal mobility, mobility channels, etc.). Whereas Sorokin's conceptualization of mobility and his terms and definitions have been used extensively in subsequent research, the theoretical propositions he presents have received little attention.

Sorokin's theoretical work may be classified as dealing with mobility as a system characteristic. Apart from his early work, little theory has been written about mobility as a characteristic of social systems although a large part of the empirical work more or less explicitly focuses on trying to establish the mobility rate for a social system -- a nation or community. The lack of theoretical work on mobility is surprising in view of the amount of theoretical work on stratification. It is clear that the two concepts are related. Stratification theory attempts to explain the inequality of positions in social structure. Mobility studies attempt to account for the movement between unequal positions. Consequently, propositions about the relation of mobility to characteristics of social structure should be important for our understanding of social systems.

Only recently has the development of a sociological theory of occupational achievement begun. The work of Blau and Duncan (1967) with linear models (path analysis) illustrates the effect of several variables on occupational achievement and to some extent tests the existence of various causal relationships. There is not, however, an overall conceptual framework in which the choice of variables is justified. For example, inclusion of the variable "education" has no justification in terms of an answer to the question of why this variable should affect achievement, but is based presumably on common sense. There is very little speculation about how occupational achievement is produced and how findings therefore should be interpreted.

Economists have produced a rather elaborate body of theoretical work on one form of occupational achievement: income and earnings. This literature is mostly ignored in sociological research, where the usual indicator of occupational achievement is occupational prestige or social status. Much economic theory of income and wages also does not deal with the role of various individual characteristics in determining income -- a main preoccupation in sociological research. At least one branch of theory on income distribution, the so-called Human Capital Approach, (see, for example, Mincer 1970) is, however, explicitly concerned with the role of individual characteristics and deals not only with the level of income, but also with the growth of income over time for an individual. It is difficult to see, though, how the information contained in intergenerational data could be used with this approach.

It was argued earlier that the methodological problems in mobility research were created to some extent by the data used. The theoretical problems also can be attributed partly to the limitations of information inherent in intergenerational data. Most clearly this is an indirect result of the methodological problems: development of a theory is hindered when measures and models do not adequately represent the conceptualization of the phenomenon which needs to be explained. In addition, the tradition of mainly collecting information on the dependent variable (the father-son occupations) may have hindered the development of any elaborate theory. Since such data are sparse with respect to information on the factors causing mobility, the findings do not invite explanation and hence theory.

In conclusion, intergenerational data are widely used despite the fact that such data are not implied by the conceptualization of mobility, nor are they the only relevant source of information to achieve the objectives of mobility research. The use of these data contributes to important methodological and theoretical problems.

Better information is needed in order to solve these problems. We shall outline in the next chapter some of the characteristics of life-history data and how they may be analyzed in order to provide a more adequate source of information.

OBJECTIVES AND METHOD OF ANALYSIS

Chapter 1 described shortcomings of intergenerational mobility data and outlined some of the consequences of these shortcomings for mobility research. The chapter mentioned briefly the character of life-history data. These data in many ways overcome the objections raised against intergenerational data. In this chapter, the life-history data are described in more detail. Following this description we outline the main objectives of an inquiry into the mobility process where these data are used.

2.1 Data: The Retrospective Life-History Study

The study that produced our data was broadly conceived of as a study of an individual's socio-economic life-cycle --how events influence other events in a person's life and the typical stages and outcomes.[1] Longitudinal data were collected on several main spheres of activity: education, employment history, family life and residential history. To cover a substantial part of the life-cycle, a retrospective, rather than a prospective study design was formulated. High importance was placed on the ability to compare and contrast the life-histories of blacks and whites.

The data on the various spheres of activities were collected with a questionnaire in tabular form, where events were recorded using a month as the unit of time. A job thus was recorded with the year and month in which it was begun, its ending date and a description of the job -- occupational title, industry, salary, etc. The interview attempted to cover all events from a person's age 14 to the date of interview. There were two samples; A national sample of all males 30-39 years of age in 1968, residing in households in the U.S., and a sample of black males in the same age group. Only the national sample is used in the present analysis. The specific form of the questionnaire, the interviewer instructions and the sampling procedure are described in detail elsewhere (Blum, Karweit and Sørensen, 1969).

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[1] The life-history study was initiated by James S. Coleman and Peter H. Rossi.

Using a month as a unit of analysis over the life history elicits an enormous amount of information. Up to half a million potential entries exist for each variable when both samples are taken together. Hence, the computer processing of the data presented a major problem if an efficient mode of analysis was to be achieved without losing too much information and flexibility. A system of programs to store and retrieve information was developed and adapted to the IBM 1401 system (the hardware system available at the least cost to the project).

The basic storage unit is a master record for each individual, and an index to this master record. The master record is of variable length, with all information pertaining to an individual recorded with beginning and ending dates, and organized according to variable number. For each variable, there are as many entries as there are events or changes in that variable. For example, in the variable "full-time employment" there is an entry for each job. The index gives the time location of each entry of each variable for an individual, and the address of that entry on the master record.

To gain access to the information stored in this way, a set of retrieval programs was developed. These programs enable the user to retrieve information pertaining to an entry of a variable at a point in time specified by the user. The time point may either refer to calendar time, age of respondent or to the time point at which a certain event occurred. In this way, it is possible to retrieve an individual's job information at a certain calendar date, or when the respondent reached a certain age, or when an event, like marriage, occurred. In addition to obtaining information relevant to a given point in time, it is also possible to retrieve the duration of occupancy of a given state, such as full-time educational activity, or the number of occurrences of certain events, such as number of periods unemployed, between two points in time. Finally, the programs enable retrieval at all entries of a given variable for a person, thus enabling events, such as jobs, to be the unit of analysis.

2.2 Objectives

The life history data do not, of course, dictate a theory of mobility nor do they solve automatically the methodological problems encountered in arriving at satisfying measures and models of mobility. Because such data provide much richer and more satisfying information about the mobility process, however, we claim that they provide a better basis for further methodological and theoretical work. Below, we shall outline briefly the objectives of this work.

The retrospective data cover a wide span of time (up to 26 years for some individuals). The sample consists of only 973 persons, forming a single cohort. It follows that our data are not very well-suited for an analysis with primary emphasis on the study of mobility as a system characteristic. A single cohort of this magnitude would provide a quite unrepresentative picture of American occupational structure in the twenty year period. In contrast, a wealth of information on individuals' background and life-history makes the data suitable for an analysis focusing on the process of occupational achievement. Such an analysis shall be our primary objective.

To overcome one of the main objections raised against existing mobility research in chapter 1, it is necessary to be able to study occupational achievement in a way that is isomorphic with the conceptualization of mobility. Thus, even if our primary objective is to study the importance of individual characteristics for occupational achievement, we should be able to make inferences also about the importance of structural characteristics, i.e., the parameters b_i, c_j and d_{ij} in equation (1.1) of chapter 1. Since the data do not give much direct information on the occupational structure, such inferences may have to be indirect, i.e. as residual to the variation in achievement explained by the individual characteristics.

In order to make inferences about the importance of structural characteristics without direct measurement of these characteristics, we need to develop some theoretical notions about the interaction of individual and structural characteristics in producing occupational achievement. The formulation of such a theoretical framework would overcome another of the objections against mobility research: the lack of theoretical concern. It will not be possible to develop a full-fledged theory of social mobility in this single study, but some attempt to formulate a conceptual framwork and some general propositions clearly have to be made in order to analyze occupational achievement satisfactorily.

To use a method of analysis that does justice to the potential of life history data and overcomes the methodological problems mentioned in chapter 1 clearly is a very important requirement. The next section discusses the various approaches to the analysis of occupational achievement with longitudinal data.

2.3 Method of Analysis

As mentioned, the data give information about the various jobs a respondent has held from age 14 until the time of interview. Jobs are characterized by their beginning and ending dates, their occupation and industry, and the salary received. Wages were converted to monthly earnings in the coding process. From the occupational title one can determine the occupational prestige of the job using prestige ratings of occupations (Siegel, 1971). We have, consequently, two criteria of occupational achievement: income and prestige.

The information about an individual's family background, educational experiences and achievements, residential movements, and family history can be used to form a great many variables that characterize the individual and his environment, as well as changes in these characteristics. These variables are potential independent variables in the analysis of occupational achievement. The richness of the data, however, gives several possible approaches to how these independent variables can be related to the main dependent variable: achievement.

Approaches to the analysis of Occupational Achievement.

There are at least three ways to investigate differences in occupational achievement.

One approach is to examine occupational achievement at a uniform point in the life history (age 30, for example). The achievement at this point then could be used as the dependent variable in an analysis where various individual characteristics are treated as independent variables. This approach would enable us to study the relative importance of the various individual characteristics in determining the level of occupational achievement at a point in time, irrespective of the achievement before and after. But analyzing achievement at only one point in time fails to do justice to the information contained in life-history data. Occupational achievement is a result of a person's job-history, and will show changes over time. An analysis that focuses on change would be more satisfactory.

The second approach would be an analysis that focuses directly on change. The dependent variable in such an analysis could be yearly changes in occupational achievement. This analysis would give knowledge about the importance of different variables for growth in achievement. It would do greater justice to the life-history data, since it would utilize the potential of such data for analyzing change -- not only change in a dependent variable, but also the effect of changes in independent variables. It is implicit in this approach that the occupational achievement of a person is a function of the prestige and income of the first job and the subsequent growth. An analysis that focuses first on initial occupational achievement level and then on subsequent growth should give a rather complete picture of the process of occupational achievement.

The problem is whether such an analysis -- even, though it may give a rather complete picture -- gives the most satisfactory picture of the process. This method ignores the fact that achievement is an outcome of an occupational mobility process. The approach conceives of achievement as continuously changing in time under the continuous influence of a set of independent variables. This conception may be as good as any.

for some purposes: the average occupational achievement of a group of people can be found to exhibit a smooth continous growth curve. However, the average achievement is an aggregate over individual growth curves that often appear to be discontinuous, since as long as a person holds a job, his achievement will not change markedly.[1] An equally true if not more realistic assumption, therefore, is to conceptualize the development in occupational achievement as a discontinuous process, where changes take place only when an individual changes jobs. This conceptualization directs attention to characteristics of the job transition an individual engages in, i.e. the determinants and outcomes of the process of going from one job to another. In this approach, occupational achievement is seen as the result of an occupational mobility process. Rather than analyzing only the variations in achievement over time, we may analyze the mechanism that produces these variations, i.e. the transition process.

In attempting to explain occupational achievement, it is natural to focus on the gain in prestige or income due to making a job transition as the phenomenon of interest. It would be misleading to analyze only this outcome, however. The actual occupational achievement a person obtains is not only a function of the outcome of job transitions made, but also of the number of transitions made. Therefore, we need to study the decision to engage in a transition (i.e. to leave the job currently held) as well as determinants of the returns of engaging in job transitions.

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[1] This is always true for prestige, since as long as the occupational title of ajob remains the same, the prestige remains the same. A change in occupational title would be registered as a job shift. For income, some change may occur within a job since monthly wages are the unit. Usually such variations in income within jobs would not be dramatic since substiantial change in duties, promotions and transfers were recorded as job shifts.

Unit of Analysis.

In the first two approaches outlined above the unit of analysis is clearly the individual. This unit could also be used with the last-mentioned approach, but it would lead to difficulties in obtaining satisfactory results. In the analysis of gains due to job-transitions, we might study the particular job transitions an individual engaged in during a certain interval of time. In the analysis of the determinants of the decision to leave a job, we could use the number of jobs held in some time interval as an indication of the individual's propensity to leave jobs. Keeping the individual as the unit of analysis would entail not only a large loss of information (all those transitions engaged in outside the critical time interval), but would also rule out the use of characteristics of jobs as an independent variable. Using the number of jobs held in a time interval as a measure of propensity to leave allows no possibility of analyzing directly how the desire to leave a job depends on characteristics of the job.

Rather than accept the difficulties raised in using the individual as the unit of analysis, we shall use the job transition itself as the unit. This means that there will be as many units of analysis as there are individuals _times_ job-transitions. Shifting the focus from the individual to the act of job transitions makes it possible to use characteristics of jobs and the occupational structure, as well as characteristics of individuals, as explanatory variables. Using transition as a unit means a gain in information and permits an analysis in accordance with the conceptualization of mobility as a function of the individual as well as characteristics of occupations.

The use of job transition as the unit of analysis has the additional advantage of solving a puzzling problem concerning the use of the variable age(or time) in life history data. In the method of analysis discussed first in this section, we would focus on the level of achievement at a certain age. There is often, however, no good justification for using one age rather than another. Also, in the analysis of yearly increases in occupational achievement, the choice of time-points is arbitrary. If the growth process is identical for all ages, then no special problems arise -- any choice of time interval will do, and averaging over successive time intervals will give the most stable estimates of the parameters of the process. If, on the other hand, the growth process changes with age, then some rather difficult problems will have to be confronted. Using transitions between jobs as a unit of analysis eliminates these problems, since the age of the job-holder engaging in a job transition can be analyzed as any other variable.

Techniques of Analysis

The richness of information provided by our data argues for a multivariate technique for the analysis of the results. Most often this technique will be multiple regression analysis. This technique seems to utilize the information better than the cross-tabulations and first-order partial correlations that are commonplace in social research. However, some limitations of multiple regression analysis should be noted.

Multiple regression analysis can be seen as a least square estimation of a simple linear model for the phenomenon studied. This is ordinarily the most primitive model possible. Rather than being a test of this model, however, regression analysis usually is used to make inferences about the existence and strength of relationships. Variables are often included in regression analysis for exploratory reasons, rather than because a comprehensive theory dictates so. It is a result of this use of multiple regression techniques that several variables measuring the same phenomenon get included in the same equation, and the effect parameters therefore partial each other out. The variability of those estimates also increases, and bias in estimates is more likely, unless we have a large sample size. The regression equation then can give a quite unrepresentative picture of the structure of interrelationships in the data. The regression equation thus is not infalliable as a technique to search for relationships, nor usually a very sophisticated model of the phenomenon studied.

To construct a comprehensive mathematical model of the process of occupational achievement would be difficult with the present state of theory and research. We shall not attempt such a task. However, we shall emphasize the considerations that lead to the inclusion of variables and attempt to specify the expected relations beforehand so that the analysis becomes hypothesis-testing rather than purely exploratory. Thus we shall attempt to move the analysis one step from the pure search for relationships toward what seems the ultimate goal -- an empirical test of a precise and well-specified theory embodied in a mathematical model.

2.4 Outline of the Study

It was concluded above that in order to analyze the process of occupational achievement two tasks must be performed. One is to analyze the decision to leave a job, another is to analyze the outcome of job-shifts in terms of occupational achievement -- prestige and income. These two tasks are the topics of the next two chapters and constitute the core of our analysis of mobility.

Since the analysis of the mobility process itself is of primary interest, and not black-white differences, we shall use only the national sample and not the special subsample of blacks in the forthcoming analysis.

THE DECISION TO LEAVE A JOB

Chapter 2 outlined two phases in the proposed analysis of the occupational achievement process. One phase is the analysis of determinants of job shifts, the other the analysis of gains in prestige and income from making a job-shift. This chapter focuses on the first problem: what makes people leave their jobs? The chapter has three sections. The first is a discussion of our choice of dependent variable and an attempt to resolve a problem created by this choice of variable -- the problem of how to deal with time. The second part outlines a theoretical framework for the analysis of the transition process. This framework will be used in justifying the choice of independent variables and in interpreting the results of the analysis. Third, we shall present the main results of the empirical investigation into determinants of the decision to leave a job.

3.1 A model for the probability of leaving a job.

The dependent variable in the analysis of what makes people leave their jobs and hence engage in job shifts, should of course be chosen so as to provide a reasonable interpretation of the phenomenon of interest as well as reflect the character of the data. To choose the probability of leaving a job as the dependent variable seems to fulfill both criteria. The probability of leaving can be conceived of as a quantity determining how long a job will be held. Individuals with a high probability of leaving are apt to leave their jobs shortly after entering and will engage in many job shifts and hold many jobs. Equivalently, jobs that are associated with a high probability of leaving (jobs with a high probability of being left) will only have short-term occupancies. In general, the likelihood that a person will engage in a job shift may be assumed to be a function of characteristics of the job and characteristics of the individual. The effect of job and individual characteristics on this likelihood will tell us the importance of those characteristics for the decision to leave a job.

Under one assumption it would be rather simple to form the probability of leaving. The assumption is that the probability of leaving does not change over time. As long as a person occupies a job there is a constant likelihood that he will leave the job -- a probability that determines the expected duration of the job. The assumption of a constant probability of leaving makes a Markov process in continuous time a tempting choice of model for the transition process. The probability $p_i(t)$ of occupying job i at time t would then change according to the equation:

$$\frac{dp_i}{dt} = - \sum_{j \neq i} q_{ij} p_i + \sum_{j \neq i} q_{ji} p_j \quad . \qquad (3.1)$$

The change in the probability of occupying a job of type i (or state i) is a function of the movement out of the job i to all other jobs and the movement into job i from all other jobs. If we focus only on the transition out of state i, we get:

$$\frac{dp_i}{dt} = -q_i p_i \quad ,$$

where (3.2)

$$q_i = \sum_{j \neq i} q_{ij}$$

In 3.2, p_i is the probability of remaining in job i at a time point t after having entered the job at time t_o. The parameter q_i is the transition rate out of job i to all other jobs or states. It is the fundamental parameter of the Markov Model. It will determine the length of occupancy in a job and may be estimated as the inverse of the duration of the job. It is a measure of the probability per unit time of leaving that will depend on characteristics of the job, but not on time. Hence, it is not necessary to specify the probability of leaving with respect to time. In addition to these advantages, this choice for dependent variable invites the use of the well-studied and quite manageable Markov model as a model for the mobility process.

In the continuous-time Markov process we just introduced, the transition rates q_i are assumed constant in time. In this situation, duration in a state (job) will be exponentially distributed:

$$f(t) = \lambda e^{\lambda t} \tag{3.3}$$

The parameter equals the transition rate out of the state, so that $\lambda = q_i$ in our notation. The mean of this distribution will equal:

$$E(t) = \int_0^\infty \lambda t e^{-\lambda t} dt = \frac{1}{\lambda} = \frac{1}{q_i}. \qquad (3.4)$$

Hence the mean duration will equal the inverse of the transition rate.

Aside from the assumption that the probability of leaving is constant in time, the Markov model entails additional assumptions. In applications of the model one would have to assume that the q_i's are completely determined by the state (the job), and independent of individual characteristics. In an investigation where the unit of analysis is jobs, this problem could be solved by taking individual characteristics as part of the characteristics of the job -- thus having as many states in the model as there are individual and job combinations. Although a somewhat artificial device, this assumption does not destroy any of the properties of the Markov model. A more serious problem is the conceptualization of the mobility process indicated by the Markov model. In the Markov model all movement is determined by the state of departure, contrary to the idea that mobility is a function of the state of destination as well as departure. As a starting point in the search for more satisfying models, the Markov model might still be useful, however, because of its well-known mathematical properties. This is especially true in the present context, where the focus is on movement out of a state or job only and not on the direction of movement.

There is a much more serious obstacle to the use of the Markov model: the probability of leaving cannot be assumed constant in time if time is measured as age of the individual. Rather, it seems quite strongly dependent on time, if we use the frequency of job-shifts with age as an indication. Since durations are spaced in age, the probability of leaving will change as the duration of the job increases. Estimating the probability of leaving as the inverse of the duration therefore becomes a dubious practice. The interpretation of our dependent variable as a parameter in the Markov model is lost, and the meaningfulness of studying the inverse of duration is unclear.

In this situation one might reject the attempt to construct the dependent variable in the framework of a stochastic process and, without further justification, focus on the duration of the job as the variable of interest. To ignore the problem of time in this pragmatic way immediately creates another problem. Since we know that our dependent variable is time-dependent, age should, of course, be introduced as an independent variable. But, which of the ages a person passes through while holding a job is the appropriate choice? To give a justified answer to this question seems impossible, and the pragmatic choice of dependent variable thus entails an arbitrary approach to the treatment of a crucial independent variable.

Psychological time

A better solution to the problem created by the time dependency is one in which this dependency somehow gets eliminated, and we thus create a varible that fulfills the Markovian assumption. This can be done by assuming that the probability of leaving is constant, not in real time, but on a time scale we call "psychological time." The concept of psychological time can be thought of as a time scale in which the unit is the interval between successive impulses to leave a job. There is a constant probability thattne individual will move on any of these impulses -- hence the Markovian assumptions will be fulfilled in psychological time.

To arrive at the desired redefinition of time we shall express the dependency of q_i on time ,rewriting equation 3.2 as:

$$\frac{dp_i}{dt} = - q_i(t)\ p_i \qquad (3.5)$$

where p_i again is the probability of remaining in state or job i entered at a time point t_o, and t is measured not from a given calendar date, but from an individual's birth.

The rate at which impulses to shift jobs occur to an individual can be denoted z (t), which has the dimension number of impulses per unit time. The dependency of $q_i(t)$ on an individual's age may be expressed by writing $q_i(t)$ as a constant, q_i^*, times the rate of impulses to leave. Slightly rearranging (3.5) we can write

$$\frac{dp_i}{p_i} = - q_i(t)dt = - q_i^* z(t)\ dt \qquad (3.6)$$

Now z(t)dt can be seen as a unit of time in the desired new time scale -- psychological time. Thus z(t)dt = dv, where v is a transformation of time which makes the process (3.5) a Markov process in v. In this time scale (3.5) can be written as:

$$\frac{dp_i}{p_i} = - q_i^* dv \qquad (3.7)$$

This is the desired process in the new time scale v. In order to obtain this transformation we will have to choose a particular function for z(t) which appears to behave in a desirable way and which can be tested for empirical adequacy. A simple function can be obtained from the process.

$$\frac{dz(t)}{dt} = - \gamma z(t) \qquad (3.8)$$

This process means that the rate of impulses to leave decreases by a constant proportion with each day of age. Consequently, the interval increases between impulses to leave, that is, a "psychological minute" becomes longer and longer with age. If we assume that the interval between impulses is what governs an individual's perception of time, then equation (3.5) implies that as the individual gets older, more and more real time elapses between impulses, i.e. time appears to go faster and faster. If we integrate (3.8) we get:

$$z(t) = e^{-\gamma t} \tag{3.9}$$

assuming $z(t) = 1$ for $t = 0$.

Equation (3.9) can be substituted into the definition of dv:

$$dv = z(t)\, dt$$

or (3.10)

$$dv = e^{-\gamma t}\, dt.$$

Integrating (3.10) gives the new measure of time or age, v_t, that constitutes pscyhological age.

$$v_t - v_0 = \int_0^t e^{-\gamma t}\, dt = -\frac{1}{\gamma}(e^{-\gamma t}-1). \tag{3.11a}$$

or, if v_0 is assumed equal to 0 so that the new measure of time or age also starts at birth, we get

$$v_t = -\frac{1}{\gamma}(e^{-\gamma t}-1) \tag{3.11b}$$

It should be noted that just as real age is measured as the number of time-units (days, years) passed since birth, so is psychological time defined in equation (3.11) as the number of psychological time units (impulses to leave or to act) passed since birth.

With this redefinition of time we can use two properties of the Markov process to define our dependent variable. The first of the two properties is the already-mentioned possibility of estimating the transition rate as the inverse of the duration of occupancy. In the time scale v, this gives the estimation

$$q_i^* = \frac{1}{v_2 - v_1} \tag{3.12a}$$

where v_1 and v_2 are the psychological ages of an individual when he enters the job at real time t_1, and when he enters the job at real time t_1.

The other property is that when an event independent of the process interrupts the process at time t_2 then the expected duration may be estimated as twice the observed, truncated duration. Hence:

$$q_i^* = \frac{1}{2(v_2' - v_1)} \tag{3.12b}$$

where v_2' is the person's age when the process was interrupted. Thus for jobs held at time of interview q_1 may be estimated as in 3.12b.

These properties of the Markov process will enable us to form our dependent variable -- the probability of leaving q_1. Before this can be done, the empirical adequacy of the transformation has to be tested. This may be done by first integrating equation (3.7), and thus solving the differential equation. The solution is

$$\log \frac{p_i(v_s)}{p_i(v_1)} = - q_i^* (v_s - v_1) \tag{3.13}$$

where v_1 is the psychological age when a person enters the job at time t_1, and v_s is the psychological age after some fixed time interval s, at time t_s. Since v_1 corresponds to the time of entry, $p_i(v_1) = 1$. Substituting for v_1 and v_s from equation (3.11) gives:

$$\log p_i(v_s) = \frac{q_i^*}{\gamma} \left(e^{-\gamma t_s} - e^{-\gamma t_1}\right) \tag{3.14a}$$

or

$$\log p_i(v_s) = \frac{q_i^*}{\gamma}\, e^{-\gamma t_1} \left(e^{-\gamma s} - 1\right) \tag{3.14b}$$

where $s = t_s - t_1$. Taking logarithms gives

$$\text{loglog } p_i(v_s) = -\gamma t_1 + \log q_i^* + \log\left(e^{-\gamma s} - 1\right) - \log\gamma \tag{3.15}$$

In this expression $p_i(v_s)$ is the proportion of those persons entering at time t_1 who remain in a job after a fixed time interval. Thus for $s = 2$, and $t_1 = 19$, $p_i(v_s)$ would be the proportion remaining after two years of those entering a job at age 19. By choosing successive ages of entry, t_1, we would obtain a series of proportions for a fixed value of s. This could be used to test the model, as the three remaining terms in equation (3.15) would be constant for a given value of s:

$$\text{loglog } p_i(v_s) = -\gamma t_1 + k \tag{3.16}$$

The empirical adequacy of the model may be tested using (3.16) in two ways. The linear relation between $\log p_i$ and t_1 may be shown by plotting the two quantities for a given choice of s. The equation also implies that the estimates of γ for each choice of s should be approximately identical. The constancy of the estimates of γ can be tested by least-square estimation of equation (3.16).

Figure (3.1) shows the graphs for the test of the linearity of t_1 and log p_i. Values of t_1 are ages 19, 20 etc. up to age 28, for s the values 10, 20 ... up to 70 months were chosen. In order for $t_1 + s$ not to exceed age 30, the last age for which the sample is complete, the values of t_1 for which log log p_i is plotted depends on the size of s -- the larger s, the fewer age points can be used.

Table (3.1) gives the estimates of γ from a least-square estimation of equation (3.16).

Table 3.1 and Figure (3.1) here

Both the linear fit, as well as the constancy of the estimates of γ , seem reasonable and we shall accept the model as empirically adequate.

We can now use equation (3.12) to estimate q_i^*, the probability of leaving. From equation (3.12a) we get

$$\frac{1}{q_i^*} = v_2 - v_1 = -\frac{1}{\gamma} \left(e^{-\gamma t_2} - e^{-\gamma t_1} \right)$$

$$= \frac{1}{\gamma} e^{-\gamma t_2} \left(e^{\gamma (t_2 - t_1)} - 1 \right) \qquad (3.17)$$

or

$$q_i^* = \gamma e^{\gamma t_2} \left(e^{\gamma d} - 1 \right)^{-1} \qquad (3.18a)$$

Table 3. 1

Estimates of γ in the Equation 3.16 for Different Values of s.

s in Months	γ	Range of t_1 in Years
10	-.072	19-28
20	-.067	19-28
30	-.076	19-27
40	-.074	19-27
50	-.068	19-26
60	-.075	19-25
70	-.061	19-24

Mean γ = .070 per year or .006 per month.

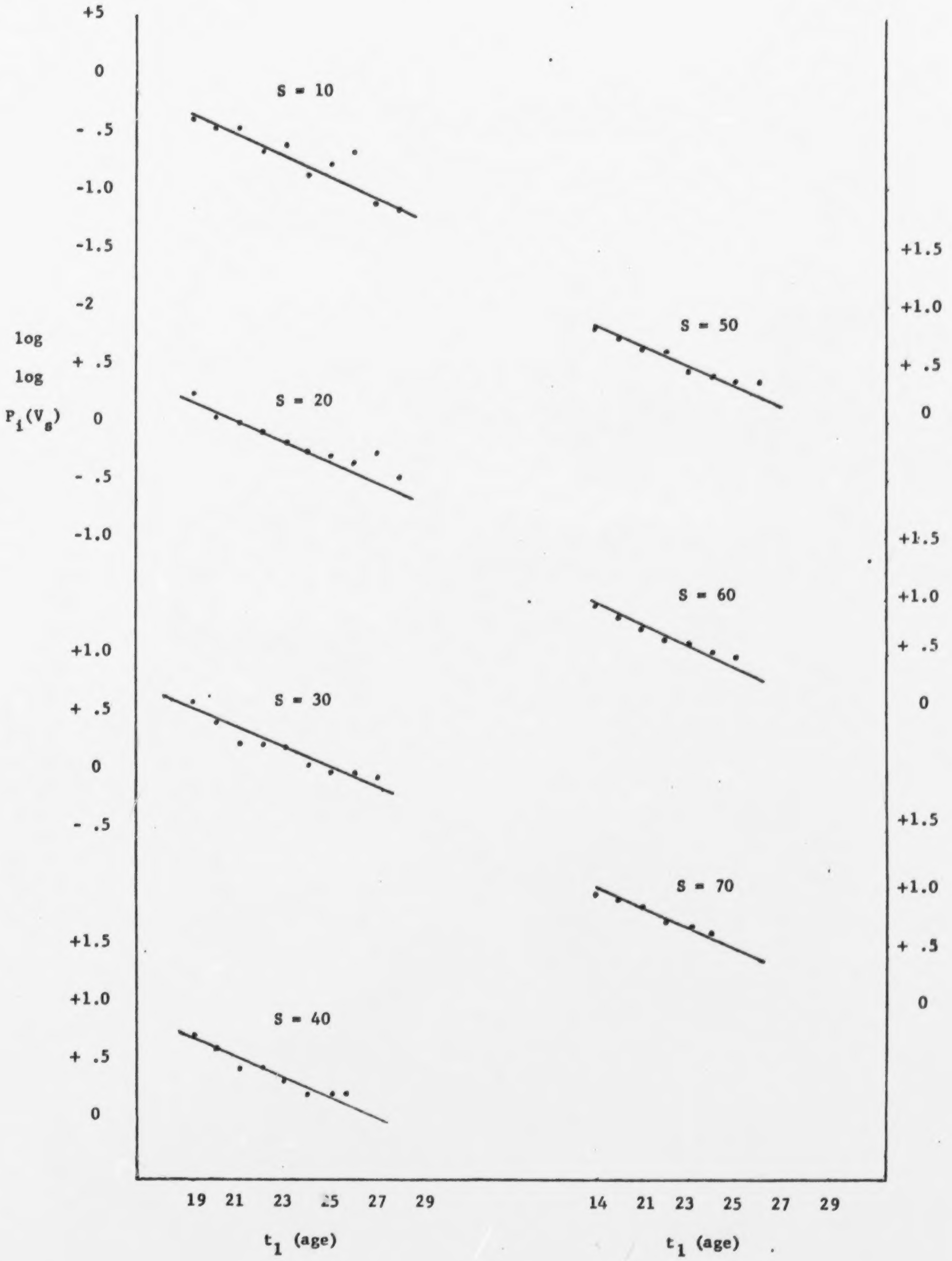

Fig. 3.1 - Proportion of Individuals Remaining in Job After s Months as a Function of Age

where $d = t_2 - t_1$

For truncated jobs we get equivalently from (3.12b):

$$q_i^* = \frac{1}{2} \gamma e^{\gamma t'_2} (e^{\gamma d} - 1)^{-1} \qquad (3.18b)$$

where t'_2 is the age of interview.

We have now been able to specify the dependency of the transition rate, or the probability of leaving, on age or time. This specification enables us to take q_i^* as a characteristic of a job and relate it to other characteristics of the individual and the job. It may be assumed that there is an exponential linear relationship between these characteristics and the probability of leaving; or

$$q_i^* = e^{b_o \sum_{j=1}^{n} b_j x_j}$$

or (3.19)

$$\log q_i^* = b_o + \sum_{j=1}^{n} b_j x_j$$

where the x_j's are characteristics of the job and the individual. This particular formulation has the conceptual advantage of expressing q_i^* as a non-zero quantity as well as being consistent with the exponential formulation of the dependency of q_i^* on age.[1]

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[1] Coleman (1964) has suggested a linear decomposition of transition rates; John Tukey suggested the exponential decomposition (see Coleman, Blum and Berry, 1970).

From equation (3.18) we get the expression:

$$\log q_i^* = - \log (e^{\gamma d} - 1) + \gamma t_2 + \log \gamma \qquad (3.20)$$

and inserting in (3.19) we get:

$$- \log (e^{\gamma d} -1) + \gamma t_2 + \log \gamma = \sum_{j=0} b_j x_j \qquad (3.21)$$

It is possible to use the equation as it is to estimate the regression coefficients b_j's by utilizing the estimates of γ obtained from equation (3.16). However a slight modification leads to a computationally simpler procedure. Transposing log γ and γt_2 to the right hand side we get

$$- \log (e^{\gamma d}-1) = \sum_{j=0}^{n} b_j x_j - \gamma t_2 - \log\gamma \qquad (3.22)$$

But for the values of γd encountered here it is possible to approximate the left hand side as:

$$\log (e^{\gamma d}-1) \simeq \log \gamma d. \qquad (3.23)$$

This approximation is arrived at by expanding the interior of the parentheses as a Taylor expansion and discarding all but the last term. The approximation is justified in Appendix A. The regression equation then becomes

$$- \log d = \sum_{j=0}^{n} b_j x_j - \gamma t_2 \qquad (3.24)$$

For truncated jobs we get through a similar argument that

$$- \log d = \sum_{j=0}^{n} b_j x_j - \gamma t'_2 + \log 2 \qquad (3.25)$$

or

$$- \log 2\, d = \sum_{j=0}^{n} b_j x_j - \gamma t'_2 \qquad (3.26)$$

A linear relationship is expected from equation (3.24) and (3.25) between t_2 and - log duration except for disturbances due to the other independent variables. This relationship is tested in figure 3.2 where mean log duration in each age group is plotted against age of leaving job, t_2. The linear relationship seems satisfactory and we shall use (3.24) in the empirical analysis.

3.2 Determinants of Job Shifts

The previous section gave the formal model for the relationship between the probability of leaving and a set of independent variables. We will now formulate more substantive propositions, using two basic assumptions about what determines the decision to leave a job.

The first assumption is that people shift jobs in order to maximize the desirability of jobs, in particular the occupational achievement in terms of prestige and income. The second assumption is that in doing so, people act rationally but are subject to various constraints on their freedom of action. These simple assumptions have a number of implications for the analysis of the transition process.

Occupational achievement is given by income and prestige. If we assume that income and prestige rest exclusively with the

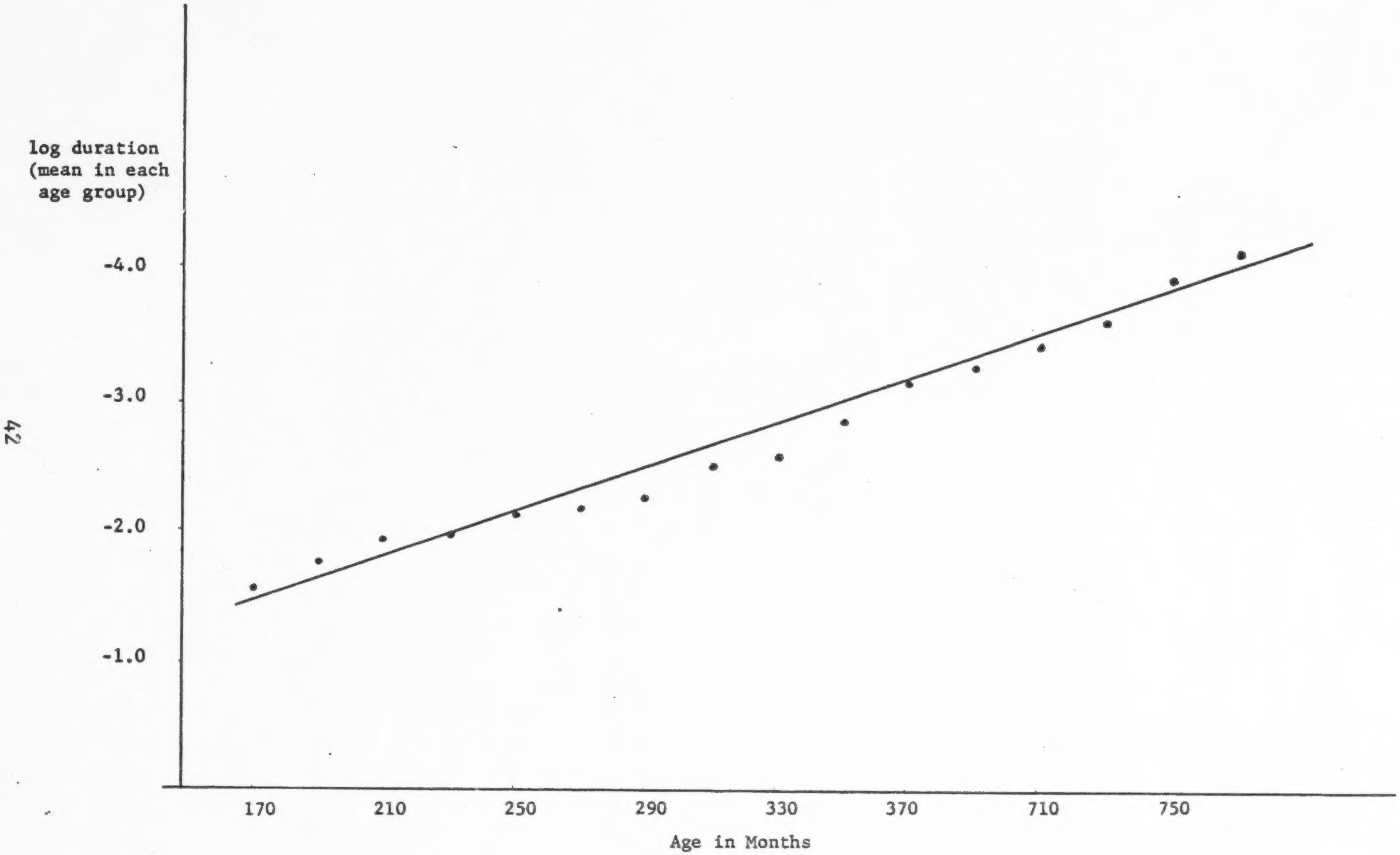

Fig. 3.2 - Duration of Job As a Function of Age

job, then to maximize income and prestige entails shifting jobs in order to make a gain in achievement. Whether such an additional gain is possible depends on the individual's resources -- those characteristics that determine an individual's value in the job market. Resources are characteristics such as education, ability, and possession of skills and characteristics demanded by higher-ranking occupations. Sometimes the attributes that constitute resources are measured directly, as is the case with educational attainment. In other cases indirect measures are used, as when family background measures a set of attributes desirable in a job market.

If we say that shifting jobs is the way to make a gain in occupational achievement, then we imply that, given the occupational achievement, the individual with the resources is more likely to leave his job. Conversely, given an individual's resources, the higher his present occupational achievement, the less likely he is to leave the job. In an equation where the probability of leaving is the dependent variable, measures of occupational achievement will have partial regression coefficients (partial on measures of individual resources) that are negative. Measures of individual resources, on the other hand, will have a positive effect on the probability of leaving, when we control for occupational achievement variables.

This basic proposition is derived from the assumption that individuals shift jobs in order to maximize occupational achievement. Our second assumption was that individuals were subject to various constraints on their freedom of action. Some of these constraints on a person's control over the decision to leave a job are imposed by characteristics of the occupational structure, which can exert pressure to leave a job.[1] The structural constraints means, in other words, that people often shift jobs more or less against their will -- they may get fired, or experience more subtle pressures to leave. In these situations we cannot expect that the above-mentioned set of variables will explain the process. The causes of the job shift are to be sought in structural factors.

Given the amount of pressure to leave a job, a person's decision to leave will be influenced by another structural factor -- the availability of vacant jobs. The two sets of structural characteristics act in opposite directions on the probability of leaving. Both availability of jobs and the pressure to leave a job will be determined by the number of vacant jobs relative to the number of individuals competing for these jobs, so that when the pressure to leave a job is high, the availability of jobs will be generally low. But the pressure to leave a job will increase the probability of leaving, other things equal, since high pressure means that a person is forced to leave before it is personally advantageous. Low availability of jobs, on the other hand, will decrease the probability of leaving, because it is less likely that an advantageous job-opportunity will be available.

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[1] It will be recalled that pressure to leave a job was denoted by the parameter $b_i(t)$ in the equation (1.1) of chapter 1.

The forces generated by pressure to leave and those generated by the availability of jobs will not be strictly interdependent. The impact of structural characteristics will be different in different parts of the occupational structure, and the decision to leave hence may be influenced by the availability of jobs in other parts of the occupational structure than the one in which an individual is located. The extent to which the availability of jobs in different parts of the occupational structure influences the decision to leave will depend on the information the individual has about the availability of jobs in other parts of the occupational structure, and on the degree to which his skills can be transferred. The availability of information and the transferability of skills may be seen as determining the distance between occupational groups, and distance hence becomes a third structural characteristic that influences the transition process.

Our data do not invite direct measures of the structural constraints on the mobility process, so we will not attempt to construct such measures. In our equation, then,some variation in the dependent variable will be due to the unmeasured structural variables. It follows that the amount of variation in the probability of leaving not explained by individual variables will indicate the importance of the structural factors. In other words, we shall assume that to the extent that persons have control over the decision to leave, the individual variables will explain the variance in the probability of leaving. The less control they have, the more structural constraints are exerted, and the less variance can be explained by individual characteristics.

There is one exception to the decision not to measure structural variables. There has been a general improvement of economic conditions throughout the period in which our cohort has been in the labor force. The per capita GNP rose every year since 1946 except for one year (1958). This increase in the wealth of the nation might be assumed to have been accompanied by more favorable job opportunities. This seems especially true for the sixties, where all our respondents had entered the labor force. Consequently, a general lessening of the constraints on the decision to leave may have been operative. It seems worthwhile to take such a general historic trend into account since it might otherwise masquerade as a biased effect of age or an age-dependent characteristic on the probability of leaving.

Assuming that the secular trend is linear, calendar year itself can be used as a very crude, but simple measure of such a historical trend. As a measure of economic conditions, calendar year is insensitive to cyclical changes around the linear trend and we are therefore forced to ignore such variations.

Another type of constraint on the decision to leave may be derived by analyzing the role of age in the decision to leave. Age may be regarded as a variable that is introduced solely to take care of the time-dependency in the probability of leaving, in the way described in the previous section. Another way of interpreting the age variable is to consider it a negative resource, since its effect on the probability of leaving is expected to be negative. This is a somewhat unreasonable interpretation. It is true that old people often have lower occupational achievement. But, our data do not contain a variation in age large enough to justify such an interpretation of the effect of age. And, it is difficult to believe that a person in the middle thirties is less desirable for an employer than a 15-year-old, even when all measures of individual resources are controlled for.

Rather than interpret the variable age as a (negative) resource, one might include age among a fourth group of variables which affects the probability of leaving. This group of variables can be labelled personal constraints. An important implication of dealing with age in this way is that our concept of psychological time must be taken as a substantive phenomenon: with increasing age, there is a tendency toward a decrease in the rate of impulses to change one's situation irrespective of other factors. Age, therefore, is not to be seen as a deficit, but as a brake on the probability of leaving a job. Another example of a personal constraint is the size of a person's household. Due possibly to the larger number of primary contacts, and as a result of greater support obligations, this variable may act as a brake on the probability of leaving, even though it has no relation to an individual's value in the labor market in itself (size of household, of course, may be correlated with measure of individual resources, such as education).

In summary, we have introduced four groups of variables as explanatory variables in the analysis of the probability of leaving: the current level of occupational achievement, individual resources that determine possibilities for gaining more prestige or income, structural constraints generated by characteristics of the occupational structure, and personal constraints such as age and size of household.

3.3 Results

The hypotheses about the causes of job shifts were tested using multiple regression techniques. The data were jobs held by men forming the national sample of the Life History survey.[1]

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[1] Jobs held during vacations while the respondent was in full-time education and jobs held just prior to enlistment in military service were deleted. The duration of both these types of jobs is to be explained by mechanisms other than the ones outlined above. These durations are determined not by the individual's concern for maximizing achievement or by employment conditions, but by factors such as the length of summer vacations and the call of the draft-board.

The data were generated by retrieving from an individual's complete life-history record each job held, and then forming a record for this job and the relevant information about the job-holder (age, race, education, etc.). Some of this information (background characteristics of job-holder) will be the same for each job held by the same individual. Some information may change from job to job for the same individual, and some variables may change also during the course of the job. In many cases it could be assumed that the variation in our variables between jobs would be much greater than the variation within jobs for the same person. If a value of a variable changes during a job, the value given below will refer to the midpoint of the job.

Income is the most conspicuous example of a variable that might vary within jobs. There are three sources of this variation. One is an inflationary increase, which, however, should have been eliminated by the price-adjustment we performed. Another cause of wage increase is a general rise in real wages. If this increase takes place without drastic and sudden changes in the wage relations between jobs, and if the increase is linear (over the duration of the job), then the mean income of the job is a satisfactory measure of the income level of the job for our use. A third source of wage increase is an upgrading of the job. This is a more troublesome case. Such an upgrading could be due to the performance of the job-holder and would therefore mean that a discrepancy between wages and individual resources results in an adjustment (which is recorded as a wage increase). If the upgrading was reached via a job-shift, the upgrading would fit our theory. When it is not recorded as a job shift, our conceptualization is not adquately operationalized, and the age-increase thus represents an error in recording of job shift.

However, it appears that in the majority of instances job shifts that should have been recorded in order to operationalize our conceptualization were in fact recorded as job-shifts. We will therefore use the price-adjusted mean income of the job. Even if job-shifts were perfectly measured, this could give an inadequate measure if wage increases are nonlinear. This might be a more serious problem when income is used as a dependent variable rather than as an independent variable as in this chapter.

Wage increases due to upgrading of jobs would, as an independent variable, reduce the probability of leaving. However, such a result would merely capitalize on what is measurement error in relation to our conceptualization of mobility. It is a basic assumption in this conceptualization that people shift jobs in order to maximize their occupational achievement. This of course presupposes that a job has a stable prestige and income level and that change in achievement level necessitates job shifts. In order to verify this assumption it seems reasonable to uphold the conceptualization and relegate the exceptions to measurement error. If the assumption is not verified, then, of course, a change in the theory is required. The variables listed below were derived from the various characteristics of the job and the job holder.

Table 3.2

Independent Variables and Their Measures

A. Measures of Occupational Achievement

- A.1 Monthly income: price adjusted to the base 1957-1959 = 100
- A.2 Prestige: based on prestige scores of U.S. Census occupations given by Siegel (1971)
- A.3 Income adequacy: respondent's self rating of the adequacy of his income on a scale from "needs outside support" to "saves."

B. Measures of Individual Resources

- B.1 Labor force experience: measured as the amount of time (in months) spent in the labor force
- B.2 Educational attainment: scored from 0 (less than grammar school) to 9 (Ph.D.)
- B.3 Family background: father's occupational prestige (as in A.2), mother's education (as in B.2), father's education (as in B.2), and number of siblings.
- B.4 Race: scored 0 = black, 1 = white
- B.5 Verbal ability: measured by a 10-item test
- B.6 Marital status: scored 0 = unmarried, 1 = married

C. Measures of Personal Constraints

- C.1 Age: in months
- C.2 Size of household
- C.3 Ownership of house: 0 = owns a house, 1 = does not own a house
- C.4 Marital status: as in B.6

D. Structural Conditions

- D.1 Calendar year

The classification of variables into resources and constraints is sometimes dubious. It is difficult to predict, for example, whether marital status should be seen as a resource or a personal constraint. One might argue that marital status is a personal constraint variable because married people usually have a more stable life-style and more obligations. On the other hand, the constraining effect may disappear when we control for a major stabilizing factor in marriage: increased size of household. Marriage acts as a resource if, other things equal, conditions associated with marriage are a spur to the male's eagerness to maximize occupational achievement. The fact that marital status is known to be correlated with ability and physical health also would give marriage status as a resource rather than a constraint.

The only measure of structural characteristics, calendar year, may be expected to have a positive effect, as the better economic conditions late in the period may be expected to increase the willingness to shift jobs, other things equal.

The regression equation with these independent variables and - log duration as the dependent variable [cf. equation (3.24)] is given in Table 3.3.

Table 3.3. here

The signs of the regression coefficients are as predicted from the above hypotheses. Measures of occupational achievement

Table 3.3

Summary of Regression of Probability of Leaving a Job on Occupational Achievement and Characteristics of the Job-Holder

Independent Variable	Standardized Regression Coefficient	t-value	Zero-order Correlation with -log Duration
A. Returns:			
Prestige	-.096	-6.67	-.221
Income	-.069	-5.36	-.263
Income Adequacy	-.065	-5.01	-.141
B. Resources:			
Race	.088	6.86	.075
Education	.064	4.96	-.076
Verbal Ability	.042	4.71	-.001
Marital Status	.039	2.92	-.250
Labor-force Experience	.063	2.53	-.413
Number of Siblings	-.027	-2.11	.015
Mother's Education	.027	1.93	.001
Father's Prestige	-.007	- .54	-.025
Father's Education	.001	.10	-.009
C. Personal Constraints:			
Age	-.680	-21.78	-.483
Ownership of House	-.059	-4.98	-.125
Size of Household	-.017	-2.25	-.033
D. Structural Conditions:			
Calendar Year	.204	8.68	-.379

$R^2 = .27$

N = 5980

have negative partial regression coefficients, measures of individual resources have positive coefficients, and measures of personal constraints have negative effects. Marriage is found to act as a resource: it has a positive effect. Calendar year has a positive effect, as predicted.

As for the importance of the effects, the standardized regression coefficients and the t-values indicate that age has the greatest relative effect by far.[1] Next comes the calendar year. The relative effect of all other variables is quite low. The effect of calendar year must be evaluated in light of a high correlation between this variable and age (r=.87). "Age" is age at leaving the job, while calendar year is measured up to the midpoint of the job. To some extent calendar year might be closely related to age of entry to the job, when age of leaving is controlled for. Its effect then is spuriously high, since age at leaving and age at entry together determine duration. The effect of calendar year should be viewed as somewhat biased, but not completely spurious.

All the independent variables are intercorrelated, sometimes quite strongly, and the relative magnitude of the regression coefficients is difficult to analyze. The sample size might guarantee against too much disturbance due to multicollinearity. However, we deal with coefficients of varibles that often are measures of the same underlying trait (e.g., ability in the case of verbal ability, education and family background), and therefore partial each other out.[1]

---

[1] The partial raw regression coefficient for age is .012. This should be compared to the mean value of γ from Table 3.1 of .006 in months as units. Part of the difference is due to the difference in estimation equations. In Table 3.3 γ is estimated in an equation where other, age-correlated variables entered. In Table 3.1 only age entered the equation. Excluding all other variables from the regression equation similar to the one presented in Table 3.3 gives an estimate of the effect of age (γ) of .008.

All variables except some of the measures of family background reach significance. It should be noted, though, that our data are quite peculiar in one respect: measurement errors may be intercorrelated over jobs belonging to the same individuals. The observations thus are not stochastically independent and a basic assumption in statistical test-theory is violated.

The zero-order correlations indicate that had we not controlled for occupational achievement, the various indicators of a person's resources would appear to bear no relation to the probability of leaving. The explanation is that these variables are positively correlated with occupational achievement. The positive effect of resources on probability of leaving is counteracted by a positive relationship between resources and occupational returns and a negative effect of returns on the probability of leaving.

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[1] One could have formed composite measures of groups of variables (e.g., family background) and/or analyzed models for their causal hierarchy(e.g., path-models). The interrelationships among the various independent variables are not of primary interest here, however, and such analysis was not performed.

Measurement of Structural Constraints

The amount of variance explained by the independent variables listed in Table 3.2 is 27%. The magnitude of the R^2 is dependent on three sets of factors. First, R^2 is dependent upon the measurement error in the variables. We may expect that the reliability of our measures is not too impressive granted that we are dealing with retrospective data. Second, R^2 is depressed by any nonlinearity introduced by interactionsbetween the independent variables. One might conjecture that interactions between age and certain other independent variables exist, but this question is not of primary interest here. Finally, R^2 will depend on the influence of unmeasured variables. As mentioned in section 3.2, some of the unmeasured variables will be structural factors that influence the probability of leaving a job. R^2, consequently, can be used as a relative measure of the importance of structural factors for the decision to leave a job.

The absolute magnitude of R^2 should not be taken as an estimate of the importance of structural constraints, in view of the other factors that contribute to R^2. A comparison of relative sizes of R^2 among subgroups should, however, give an indication of variation in the importance of structural constraints on the mobility process between these subgroups.

An obvious way to validate this interpretation of R^2 is to compare job-shifts where the job as left voluntarily, and job-shifts where respondents stated that leaving the job was not their own decision. Respondents were asked this information, and although the replies may be somewhat unreliable, we will use these data as an indicator of the extent to which structural factors influenced the decision to leave a job. The result of this validation of the interpretation of R^2 is presented in Table 3.4.

Table 3.4 here

For those who state that they left their job involuntarily, R^2 is substantially lower than for others. It appears, therefore, that the difference in R^2 can be taken as a measure of the importance of structural factors in influencing the decision to leave. The signs of the regression coefficients are the same for both subgroups, indicating that the two groups are not different in the way the mobility process works. Voluntary/involuntary leaving of a job should probably be conceived of as a matter of degree rather than as a dichotomous distinction. A response stating that the job was left involuntarily can be assumed to be probabilistically related to the pressure to leave the job. The two groups seem to differ in the pressure to leave the job exerted on them, but not, we repeat, in the way the basic mobility mechanisms work.

A test of significance of the difference in R^2 between the two groups is desirable. The sampling distribution of R^2 is

Table 3.4

Summary of Regression of Probability of Leaving a Job for Persons Who Stated They Did, Versus Did Not, Leave Job on Their Own Decisions.

Independent Variables	Not Own Decision Raw Regression Coefficient	Not Own Decision t-value	Own Decision Raw Regression Coefficient	Own Decision t-value
A. Returns:				
Prestige	-.0010	-7.78	-.0008	-6.29
Income	-.0004	-4.51	-.0002	-4.71
Income Adequacy	-.0857	-5.07	-.0944	-5.14
B. Resources:				
Race	.5226	13.00	.3051	6.03
Education	.1238	8.96	.0825	5.69
Verbal Ability	.0301	6.57	.0364	4.11
Marital Status	.0165	.51	.1037	2.84
Labor-force Experience	.0062	12.58	.0012	2.53
Number of Siblings	.0052	1.55	-.0143	-2.62
Mother's Education	.0301	2.36	.0267	2.07
Father's Prestige	.0006	4.53	.0001	.83
Father's Education	.0146	1.31	-.0037	- .31
C. Personal Constraints:				
Age	-.0141	-26.81	-.0121	-21.72
Size of Household	-.0091	-1.51	-.0188	-2.46
Ownership of House	-.0358	-1.24	-.1625	-5.20
Structural Conditions:				
Calendar Year	.0700	15.22	.0341	7.02
R^2 =	.20		.29	
N =	962		4455	

Note: Jobs held at time of interview counted as own decision.

very complicated. Kendall (1952) gives an approximation formula for the variance of R^2, when the true R^2 is not 0. The formula is:

$$\sigma^2(R^2) = \frac{4R^2(1-R^2)^2}{n} \qquad (3.28)$$

Using this formula we can compare significance intervals corresponding to the 95% level for the two groups. For those who left voluntarily, the result is $R^2 = .29 \pm .02$, and for those who left involuntarily $R^2 = .20 \pm .04$. Since the confidence intervals are non-overlapping we conclude that the difference is significant.

Another way of confirming the interpretation of R^2 as a measure of structural constraints in the mobility process is to relate variations in R^2 to variations in unemployment, assuming that unemployment rates reflect structural factors. Such a comparison has been performed for different industries. For each major industry group a least-square estimation with the same set of variables as in Table 3.3 was performed. The R^2's for each industry are given in Table 3.5, together with the unemployment rates. The unemployment rates were computed as the number of jobs in each industry which lead to unemployment rather than to another job, over the total number of jobs in each industry.

Table 3.5 here

Table 3.5

R^2's from Regression of Probability of Leaving in Different Industries and Unemployment Rates

	R^2	Unemployment Rates	N
Industry:			
Agriculture	.38	2.8	588
Construction	.26	9.6	909
Manufacturing:			
Durable Goods	.23	12.6	1206
Non-Durable Goods	.34	6.2	672
Transportation	.39	6.9	471
Wholesale and Retail	.30	5.7	918
Finance, Insurance, Etc.	.39	4.3	198
Services	.34	5.4	598
Public Administration	.37	4.9	209

Note: Industry not reported: 211

Unemployment rates based on N-1 jobs.

As could be expected, the two industries, construction and manufacturing of durable goods, with the highest rate of unemployment over the lifespan of our sample, are also the two industries where R^2 is lowest. For the remaining industries the association between R^2 and unemployment rates is not altogether orderly. Still, the difference between construction, manufacturing of durable goods, and other industries does indicate that our interpretation of R^2 seems justified.

A measure of the degree of association between R^2's and unemployment rates would be the correlation between the two. However this correlation would be influenced by differential variability of the measure due to the relation between R^2 and the variance of R^2 and to the different size of the industries. A variance-stabilizing transformation of R^2 is Fisher's z-transformation, and the impact of different sizes of industries can be reduced by weighting with the N of industries. Using z-transformation and weighting we obtain a correlation of .89 between the measure of the impact of structural characteristics developed here and unemployment rates.

Further information concerning the impact of the various structural characteristics might be obtained by analyzing R^2 separately for those who did and those who did not leave their job voluntarily within industries. However, the distribution of stated control is so skewed that the approach does not add to the knowledge already gained. The correlation between R^2 and unemployment rates is reduced for those who left their jobs voluntarily, as would be predicted, but only from .89 to.80.

3.4 Conclusion

This chapter has attempted to carry out the first part of the analysis of the mobility process: the analysis of the decision to engage in a job shift and leave the job held. Three tasks had to be performed in order to complete this analysis. First, we had to form our dependent variable so that the available data were well-utilized and a reasonable interpretation of the phenomenon of interest was obtained. Second, we had to develop a theoretical framework for the classification of variables, formulation of hypotheses and interpretation of results. Third, we had to demonstrate the empirical adequacy of the outcome of the first two tasks.

The first task involved a rather elaborate argument for the creation of a measure of the probability of leaving -- our choice for dependent variable. Since we wanted to be able to characterize a job, our unit of analysis, by the likelihood with which it would be left, a time-independent measure was needed. The solution involved a redefinition of time or age through the concept of psychological time -- a time scale on which the transition rate or probability of leaving is constant. The concept of psychological time means that as people get older the rate at which they will get impulses to act -- in this case to shift jobs

-- goes down. This change of pace defines the new time scale. The mathematical specification of this idea was tested empirically and the model found to be adequate.

The concept of psychological time tells us the dependency of the probability of leaving on age. The specification of relationships between other independent variables and the probability of leaving was made possible by the outcome of the second task: the formulation of a theoretical framework. We started with two basic assumptions -- that people leave their jobs in order to maximize occupational achievement, and that certain constraints restrict their freedom of action. From the first assumption we deduce that, given a person's resources (education, ability, etc.), the higher the occupational achievement, the less likely he is to leave his job. Conversely, given the occupational achievement, the more desirable a person is in the job market, the more likely he is to leavea job, because his chances of obtaining an additional gain in achievement are better. From the second assumption we deduce that the importance of constraints can be inferred from the amount of variance explained by occupational achievement and resources, since those variables explain the probability of leaving in proportion to the amount of control an individual has over the decision to leave. The amount of variance explained therefore measures the importance of structural constraints, for which no direct measure is available. Another type of constraint, personal constraints, acts as a brake on the probability of leaving and can be measured directly with our data. Age is one of these variables.

The empirical test confirmed the basic propositions. The signs of the partial regression coefficients of variables measuring resources are positive, and the signs of measures of achievement are negative. As predicted, measures of personal constraints had a negative effect on the probability of leaving. It was shown also that the amount of variance explained by these first three groups of variables can be taken as a measure of structural constraints on the decision to leave. The amount of variance explained thus varied with the individual's stated control over the decision to leave. Also, there was a satisfactory covariation between this measure of the importance of structural characteristics and the unemployment rate in different industries and occupational groups.

The conceptual framework outlined in this chapter will be used again and further extended in chapter 4 where we analyze the outcome of the job shift. The concept of psychological time will play a less direct role in the rest of the analysis. It is believed, however, that this redefinition of time can be of use in the study of other, time-dependent phenomena. The same basic regularity has been shown to hold also for migratory moves (see Blum and Sørensen, 1970). The basic idea has interesting biological similarities (see for example Lecomte du Noüy [1937] for a similar concept of "biological time").

OUTCOMES OF JOB SHIFTS

Returns on Job-Transitions

Having studied the decision to leave a job, we will now examine the actual outcomes of a job shift in terms of gains in prestige and income. A basic assumption used in the analysis of the decision to leave a job was that an individual shifts jobs in order to maximize his occupational achievement. This chapter offers an opportunity to further explore some consequences of this assumption, this time focusing on the actual returns from making a transition. We shall utilize the same conceptual framework as in Chapter 3 and stress the problems associated with making inferences about the role of structural as well as individual characteristics. We shall begin by developing a simple model for the return on job shifts that will enable us to make inferences about the importance of characteristics of the occupational structure for the outcome of job shifts. Next we will present the results of the empirical analysis: first, a section stressing the importance of individual characteristics for gains in prestige and income and second, a section on how characteristics of the occupational structure influence the outcome of job-transitions.

4.1 A model for returns on job-shifts.

For each job-transition one can compare the differences in prestige and income between the job left and the job entered.

These differences represent a measure of the returns on making a job-transition. The simplest choice of model for this return would be a linear one for the dependency of the gains in achievement on various independent variables. Hence,

$$\Delta x_1 = b + \sum_{i = 1} b_i x_i$$

where $$\Delta x_1 = x_{12} - x_{11} \qquad (4.1)$$

x_{12} and x_{11} denotes the achievement (income and prestige) of the job entered (x_{11}) and the job left (x_{12}). The index i ranges over the set of independent variables.

It is desirable to be more explicit about which independent variables to enter into the equation (4.1), and how to interpret their relationship with gains in achievement. This objective may be achieved if we start from the assumptions about the mobility process stated in Chapter 3, section 3.2. The first of these assumptions was that individuals engage in job shifts in order to maximize their occupational achievement. The second assumption was that in doing so, their freedom of action was constrained by personal and structural factors. One set of structural constraints are those generated by the pressure to leave a job. These constraints affect a person's control over the decision to leave. They are at maximum when a person has no control over the decision to leave, and at minimum when he has full control. These notions may be used to derive a simple model for the gains on making a job shift.

Suppose that a person in fact has full control over the decision to leave a job. He should then only leave his job when he can realize a maximum gain for his resources. He will not be dependent on the employment situation, i.e. the availability of vacant jobs, since he is the one who determines when to leave a job. In this situation the person will realize a gain in achievement determined only by his resources:

$$x_g = a_o + a_2 x_2 \qquad (4.2)$$

where x_g denotes the maximum gain possible given a person's resources, and x_2 is a composite measure of a person's resources.

The parameter a_2 gives the effect of resources on gains in achievement. For a given choice of resource variables this effect tells us how well the resource variables chosen in fact determine a person's value in the job market. The parameter a_2 therefore gives us the conversion rate between a given set of resource variables and gains in occupational achievement.

If an individual has less than full control over the decision to leave a job, then he is not completely free to shift jobs only when the maximum gain can be realized. The outcome of the transition depends also on which jobs happen to be vacant when he leaves the job previously held. It may be assumed that the number of vacant jobs are negatively related to the income and prestige of the job left. It follows that the higher the achievement of the job left, the fewer vacant jobs yield an equal or higher occupational achievement.

Suppose that a person in fact has no control over the decision to leave his job, i.e. he gets fired. The outcome of the job shift then depends completely on which jobs are vacant when he leaves. But, when he has no control over the decision to leave, he will be expected to suffer a loss in occupational achievement. This follows from the assumption that people maximize their occupational achievement. If they do so, then they would have left their job before getting fired if a better job was available. In other words, when persons have no control, a loss is the expected outcome of the job transition. From the assumption that the number of vacant jobs are negatively related to the achievement of the job left, it follows that the size of the expected loss will be negatively related to the prestige and income of the job left. Formally,

$$x_v = d_0 - d_1 x_{11} \qquad (4.3)$$

where x_v is the expected loss in achievement. Since this loss is dependent on the availability of vacant jobs, the parameter d_1 measures how strongly the availability of vacant jobs depends on the prestige and income of the job left. If d_1 is small the availability of vacant jobs is only weakly dependent on the level of achievement reached by the job left, and the loss in achievement is dominated by unmeasured variables expressed by d_0. If d_1 is high, then the availability of vacant jobs is strongly dependent on the occupational achievement, so that the higher the income and prestige level, the fewer vacant jobs are available.

The parameter d_1 measures how far down the occupational ladder a person will have to go to find a vacant job, and thus measures the inequality of job opportunities. If vacant jobs are distributed like filled jobs, d_1 will reflect the shape of the occupational distribution according to prestige and income. The more skewed this distribution, the higher d_1, other things equal. Given the shape of the occupational distribution, the size of d_1 will vary according to the overall ratio of vacant jobs to filled jobs, or the employment situation. A high proportion of vacant jobs will result in a low value for d_1 as the competition for jobs will be weaker. A small proportion of vacant jobs will result in a high value for d_1, since the fewer vacancies will make it less likely that a job with high prestige and income can be found.

Inferences about the behavior of d_1 are made under the assumption of no measurement error. Measurement error also affects the magnitude of d_1, as we shall discuss later.

We can in general express the amount of control over the decision to leave a job by a variable c, where c has a maximum of 1 if a person has full control, and c = 0 if he has no control. The expected gain of a job transition now can be expressed as:

$$\begin{aligned} x_e &= cx_g + (1 - c)\ x_v \\ &= c\ (a_o + a_2x_a) + (1 - c)\ (d_o - d_1x_{11}) \qquad (4.4) \\ &= (ca_o + (1 - c)\ d_o) + ca_2x_2 + (1 - c)\ d_1x_{11} \end{aligned}$$

In this expression x_e may be estimated by $\Delta\ x_1$, and we can rewrite the equation:

$$\Delta x_1 = b_o + b_1 x_{11} + b_2 x_2 \qquad (4.5)$$

where $b_1 = (1 - c)\ d_1 \leq 0$ and $b_2 = ca_2 \geq 0$

where b_1 is assumed less than or equal to 0 and b_2 is expected to be greater than or equal to 0. Equation (4.5) is of the same form as (4.1) but rather than a composite measure of a person's resources expressed by x_2, equation (4.1) would have a set of variables indexed by i.

In equation (4.5) the parameter b_1 is dependent on c as well as on d_1. This means that b_1 is dependent on two sets of structural factors: those that influence his control over the decision to leave, and those that determine his job opportunities once out of the job. The coefficient b_1 will have a value of zero for the situation where individuals are in full control of the mobility process (assuming no measurement error). The coefficient will have a minimum value equal to d_1 when individuals have no control over the mobility process. This value will depend on the degree to which the availability of vacant jobs is linearly dependent on the occupational level.

Since b_1 is dependent on the degree to which individuals are in control over the mobility process, b_1 may be used as a measure of the importance of structural constraints on the decision to leave. However, b_1's dependency on d_1, that is, the relation between availability of jobs and occupational levels, makes it a not completely satisfactory measure. An alternative measure would be the amount of variance explained by resources in equations like (4.5).

When c = 1, x_{11} will have no effect and all variance in the gain will be explained by resource variables. When c = 0 all variance will be explained by the achievement of the job left. In general the amount of variance explained by resource variables will vary inversely with the impact of structural characteristics on the decision to leave a job.

It may be problematic, though, to partition the amount of variance explained by equations like (4.5) between resources and x_{11}, i.e., the income or prestige of the job left. When the amount of variance explained by resources goes down, the variance in Δx_1 explained by x_{11} should go up,according to our assumptions. However, either of the two variables alone may explain less variance than when brought together, as they are positively correlated but have opposite effects on Δx_1. In the empirical analysis we shall return to these problems in detail and attempt to determine which measure is more satisfacory.

It should be noted that to omit x_{11} in the equation would lead to a serious bias in the estimate of b_2 (or a set of b_2's). Resources and x_{11} are positively correlated, and failure to include x_{11} will lead to an underestimate of b_2, as the estimate will depend partly on the negative effect of x_{11} on Δx_1. So far we have ignored the possible impact of measurement error on the parameters of equation (4.5).

The parameter b_1 is often interpreted as a measure of the tendency to regression toward the mean. We have avoided such an interpretation and given an interpretation consistent with our conceptual framework. The two interpretations are not inconsistent. As pointed out by Coleman (1968) the regression effect partly depends on a negative feedback through unmeasured variables. The availability of jobs at different occupational levels clearly represents unmeasured variables that produce a negative feedback on x_{11}. We have ignored the other component of the regression effect, random measurement errors, so far in our discussion. Such errors influence the size of b_1 also in our case. However, we shall use b_1 in comparisons of sub-groups, and the impact of measurement errors on b_1 may be assumed to be the same in all sub-groups. Thus, since we are primarily interested in the relative magnitudes of b_1 the problem of measurement error becomes less crucial, although not to be ignored. The fact that b_1 also depends on measurement error adds to the difficulties of identifying the structural characteristics.

Equation (4.5) gives the gain in prestige and income, as a function of resources and the achievement of the job left. A career may be defined in terms of variations, over time, in prestige and income. Such variations are produced by job-shifts, and it follows that knowledge of the outcome of job shifts will enable us to predict the career line. Equation 4.5 may be used as a base for the derivation of models to predict the career line but we shall postpone this derivation, and turn directly to the empirical analysis of gains from job shifts.

4.2 Determinants of returns on job-shifts.

The previous section gave us the basic model for the analysis of gains in occupational achievement. This model expresses gains as a function of an individual's resources and the level of occupational achievement of the job left. It will be recalled that in Chapter 3 we introduced four groups of variables to explain the probability of leaving a job: occupational achievement, individual resources, personal constraints and structural characteristics. It is appropriate to discuss briefly how these variables fit into the model outlined in the previous section.

Our interpretation of certain sets of variables as variables measuring individual resources can be validated by showing that these variables do in fact have an effect on gains in occupational achievement. However, the relative importance of the various resource variables may not be exactly the same in this analysis as in Chapter 3. Here, we are dealing with the relative importance of resources for actual gains in prestige and income; before, we analyzed the relative importance for anticipated gains.

The group of variables called personal constraints were introduced in Chapter 3 as variables that act as a brake on the probability of leaving, but that do not affect a person's value on the job market. It follows that variables measuring personal constraints should not affect the outcome of the job shift. The interpretation of certain variables as personal constraints therefore also may be validated in this analysis.

Of the structural characteristics, calendar year should be reintroduced because of its high correlation with age and labor-force experience. The calendar year is again an indicator of the state of the economy. The overall expansion of the American economy means that, other things equal, a job transition later in the period covered by our study should bring a greater return than a job transition early in the period. For prestige this is the case if the increase in wealth is accompanied by an increase in the supply of upper and middle prestige jobs. This increase in the availability of better jobs should lead to a higher expected gain, other things equal. For income the same mechanism holds, but in addition the general increase in wages will produce a higher expected gain from job shifts, as gains are given as absolute gains here and not relative, percentage gains. Even if calendar year is a crude indicator of the state of the economy it is important to introduce this variable so as to eliminate a possible spurious effect of age. Age is conceptualized as a personal constraint and is expected to show no effect on gains in achievement.

We have already introduced the problems of measuring the impact of other structural characteristics. This discussion will be elaborated in a subsequent section.

The results of the data-analysis will initially be presented for prestige and income separately. Prestige and income are two separate indicators of occupational achievement, and job transitions, we hypothesize, are made in order to maximize both. A method that makes it possible to analyze gains in prestige and income simultaneously will then be introduced. This is the canonical correlation method.

The use of job shifts as a unit of analysis gives as many units as there are job shifts undertaken by our sample of respondents. This choice of unit may raise a question concerning the extent to which the results may be used to make inferences about the occupational achievement of individuals. This problem will be dealt with in a section following the analysis of gains in achievement.

Finally, the last section will return to the model expressed by equation (4.5) and attempt to validate the statement concerning the importance of structural characteristics for the outcome of job shifts that were presented in the first section of this chapter.

4.3 Gains in prestige and income and their relation to individual characteristics

We will focus here on the contribution of individual resources and constraints to gains in occupational achievement. It is advantageous to rewrite equation (4.5) as:

$$x_{12} = b_1^* x_{11} + \sum_i b_i x_i \qquad (4.6)$$

where $b^* = 1 + b_1$

This equation is idential to (4.5) except that $b_1^* = 1 + b_1$ and $b_2 x_2$ has been expanded to give all independent variables except for x_{11}. This reformulation is advantageous because it otherwise would be difficult to interpret a partitioning of the variance explained. The measure of effect obtained by evaluating the amount of variance explained by a given variable (or set of variables) is normally found by comparing the unique amount of variance explained by a variable to the maximum amount explainable by a given variable. The unique amount of variance is obtained as the addition to R^2 obtained when the variable in question is entered last in the equation. The maximum amount explainable is the squared zero-order correlation. In the original formulation of equation (4.5) the two independent variables have effects with opposite signs on the dependent variable but have a positive intercorrelation. In this situation it can be shown that the unique amount of variance explained by either variable will exceed the squared zero-order correlation.*) This situation is avoided in (4.6) where the partitioning of the variance can be performed as usual.

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*) The zero-order correlation will be depressed since either variable also will act as a proxy for the other which has an opposite effect on the dependent variable.

4.3.1 Gains in prestige

Table 4.1 presents the results of a multiple regression analysis with prestige of the job entered as the dependent variable and the various individual characteristics (resources and constraint measures) as independent variables.

Table 4.1

The mean prestige of the job left is 325 points, the mean prestige of the job entered is 343 points. This gives an average gain in prestige per job shift of 18 points or 5.5% of the prestige of the job left. The standard deviation of prestige of the job left is 134 points; of the prestige of the job entered, 138 points. Taken together this means that as a person passes through job shifts, the prestige level will increase on the average, and the variance between persons in prestige will increase somewhat. Since the variance between persons in prestige is a measure of the inequality of prestige, we find that as our cohort gets older the inequality of prestige increases somewhat, and the overall level of prestige becomes higher.

The raw regression coefficient of the prestige of the job left (b_1^*) is .41. The parameter b_1 of equation (4.5) then is -.59. This means that for a one point increase in the level of prestige of the job left, a loss of .59 points in prestige is expected when a job shift is undertaken (other things equal). This negative effect of the prestige level of the job left is

Table 4.1

Summary of Regression of Gains in Prestige on Characteristics of the Job-Holder

Independent Variable	Regression Coefficients Raw	 Standardized	t-value
A. Returns:			
Prestige of Job left (X_{11})	.41	.396	27.97
B. Resources:			
Education	19.74	.224	12.13
Labor-force Experience	.13	.061	2.23
Fathers Prestige	.07	.067	5.01
Verbal Ability	4.66	.075	4.82
Marital Status	14.00	.049	3.69
Race	19.22	.054	3.52
Mothers Education	- 1.00	- .012	- .81
Number of Siblings	- .36	- .011	- .74
Fathers Education	- .07	- .008	- .55
C. Constraints:			
Age	.03	.017	.46
Size of household	- .87	- .011	- .91
D. Other:			
Calendar Year	.96	.050	1.83

$R^2 = .454$

Unique amount of variance explained by prestige of job left	.103
All other variables	.085
Maximum amount of variance explainable by prestige of job left	.370
All other variables	.352

N = 4203

predicted from our model (4.5) and is assumed to be a function of both the amount of control a person has over the decision to leave and the distribution of job opportunities. The estimate we obtain of this effect is also influenced by measurement error.

The negative effect of the prestige of the job left on the gain is compensated for by positive effects of resource variables. Dominating among those effects is that of education. Its raw regression coefficient is 19.74. This means that for a unit increase in education there will be a nearly twenty point increase in prestige. Since education is coded so that two units of education corresponds to a difference in degree level, we find, in other words, that an increase in educational attainment from grammar school to high school diploma, or from high school to college degree,will return 39 prestige points in the average job shift (all other variables held constant). The relative effect of education in relation to other variables can be measured by the standardized regression coefficient. This coefficient gives the amount of change, in units of standard deviations of prestige, per unit of change in standard deviation of education. Since we know that the standard deviation of the prestige of the job entered is 138 points, we find that one standard deviation increase in education contributes 30.97 points to the prestige level of the job entered. Similar computations could be carried out for other independent variables, but in evaluating relative effects the standardized regression coefficients serve equally well.

Controlling for education and other resource variables, verbal ability shows a relative effect substantially lower than education, but highest among the remaining resource variables. As one would expect verbal ability is highly correlated with education (.60). Its partial effect, when education is controlled for, may be interpreted as partly reflecting the quality of education received (the test is taken at the time of interview) and partly reflecting ability of a person that has not been transformed into educational attainment. This same interpretation may be given to father's prestige as a measure of how favorable the family background was. The raw regression coefficient to father's prestige is .07, indicating that a one-point increase in father's prestige returns .07 points in average prestige gains. Other family background measures do not have a significant effect when all background variables are introduced simultaneously in the equation. The collinearity of these variables should be taken into account when evaluating this result.

Labor force experience has a relative effect below father's prestige and ability. Its raw regression coefficient is .13, so that one month additional time spent in the labor force returns .13 prestige points. Labor force experience is highly correlated with age and calendar year, and its effect should be interpreted in light of this collinearity.

Marital status has a significant effect coded as a dummy variable where the value 1 indicates that the respondent is married and the value 0 indicates otherwise. Expressed this way, a married person gains on the average 14.00 more prestige points than an unmarried person when engaging in job shifts. This confirms the interpretation of marriage as a resource given in Chapter 3. The effect of marriage may reflect a beneficial effect of the state of marriage on a person's possibilities for obtaining better jobs, but could also reflect a selection effect of marriage, so that marriage indicates ability differences not measured by other variables.

The raw regression coefficient for race shows that whites on the average receive an 18 point greater gain in prestige than blacks. Race has, however, the lowest relative effect of those variables that reach significance. This is in contrast to the results of Chapter 3, where it was shown that race ranked high among those variables that affected the probability of leaving a job. Whites, other things equal, were more likely to leave their jobs than blacks. The relative lower effect of race here will be commented upon further in the analysis of income gains.

The relative effect of resource variables can be measured in several ways, one of those being the standardized regression coefficients already used. The collinearity among resource variables does, however, invite caution when interpreting the standardized regression coefficients, as this measure will be influenced by the intercorrelations among the independent variables.

In table 4.2 three different measures of relative effect are given in order to further analyze the relative effect of resource variables. One of these measures is the zero-order correlation coefficient. This is a measure that attributes the maximum amount of variance explainable by a variable to the variable in question since all variance shared with other variables is attributed to the variable focused upon.

The second measure presented in table 4.2 is the standardized regression coefficient already utilized. The third measure is the unique amount of variance explained. This measure is obtained as the addition to the total amount of variance explained by all independent variables (R^2) when the variable in question is entered last in the equation. This is the most conservative measure of effect as it excludes from the variable in question all variance that it shares with other variables. Table 4.2 gives the square root of the unique amount of variance explained, in order to obtain a measure of the same magnitude as the correlation coefficient and the standardized regression coefficient.

Table 4.2

The numbers in parenthesis in table 4.2 are the rank orders of the variables according to the various measures of relative effect. It is clear that regardless of how effect is measured education has the highest rank of the various resource variables. Also, the rank of other variables remains stable, with no major

Table 4.2

The Relative Effect of Various Resource Variables on Gains in Prestige According to Three Alternative Measures of Effect

Independent Variable	Zero-Order Correlation		Standardized Regression Coefficient		Unique Amount of Variance Explained (sq.root)	
Education	.517	(1)	.224	(1)	.149	(1)
Verbal Ability	.393	(2)	.075	(2)	.056	(3)
Father's Prestige	.301	(3)	.067	(3)	.057	(2)
Marital Status	.242	(4)	.049	(5)	.044	(4)
Race	.192	(5)	.041	(6)	.040	(5)
Labor Force Experience	.171	(6)	.061	(4)	.039	(6)

Based on regression presented in Table 4.1. Numbers in parenthesis refer to rank-order.

reversals in rank order when we compare the various measures.

The effect of other types of variables shall be briefly commented upon. Size of household does not have a significant effect on gains in prestige, as we would expect from our interpretation of size of household as a constraint variable that only affects the probability of leaving a job, and not the outcome. Age has no significant effect either, a confirmation of the interpretation of age as a constraint variable.

Calendar year has a positive, but insignificant effect on gains in prestige. Calendar year, age and labor force experience are highly intercorrelated, and introducing them simultaneously in the equation depressed the measure of effect we obtained for those variables. Age has no unique contribution to the amount of variance explained. If we therefore delete age for the equation, it can be shown (results not presented) that calendar year does reach significance although its relative contribution still is modest. It therefore seems that there is a modest tendency to obtain greater pay-offs in prestige when shifting jobs later in the period, presumably as a result of an expansion of upper and middle prestige jobs.

4.3.2 Gains in income.

Using equation (4.6), but with income replacing prestige, gives the results presented in Table 4.3.

Table 4.3

Table 4.3

Summary of Regression of Gains in Income on Characteristics of the Job-Holder

Independent Variable	Regression Coefficients Raw	Standardized	t-value
A. Returns:			
Income of Job Left (X_{11})	.61	.577	48.59
B. Resources:			
Education	11.66	.079	5.03
Marriage	24.44	.053	4.22
Verbal Ability	5.32	.050	3.48
Labor-force experience	.13	.032	2.50
Fathers Prestige	.49	.027	2.08
Race	14.33	.020	1.67
Number of Siblings	- .73	- .010	- 0.79
Fathers Education	- 1.05	- .007	- 0.48
Mothers Education	- .06	- .001	- 0.05
C. Constraints:			
Age	.09	.025	0.77
Size of Household	4.71	.045	3.79
D. Other Variables:			
Calendar Year	3.05	.089	5.03

R^2 = .491

Unique amount of variance explainable by:	
Income of job left	.265
All other Variables	.048

Maximum amount of variance explainable by:	
Income of job left	.453
All other variables	.236

N = 4203

The mean monthly income of the job left is \$391.84 and the mean income of the job entered is \$411.07. This gives a mean gain in income of \$19.23, or 4.9% of the income of the job left. The standard deviation in income of the job entered is \$232 and of the job left \$220. This gives an increase of \$12 or 5.4% of the standard deviation of the job left. The average job shift produces an increase in income level and also an increase in the variance of income. The relative increase in the variance of income is somewhat higher than for prestige (5.4%, against 3.0%), indicating that as our cohort ages the inequality of income (as measured by the variance) increases -- more than in the case of prestige.

The raw regression coefficient of the income of job left is .61. This gives a value of the parameter b_1 in equation (4.5) of -.39. When resource variables are controlled for, a dollar increase in the income of the job left reduces the gain from shifting jobs by an average of 39 cents. The coefficient b_1 is substantially different from the coefficient to prestige of the job left -- a difference to be commented upon in the latter part of this section.

As with prestige, education has the highest relative effect among the resource variables, when we measure effect with the standardized regression coefficient. The dominance of education is not as clearcut as with prestige, however. The raw regression coefficient of education means that for a unit increase in education, a $11.66 gain in income will result in the average job shift, other things equal. Since two units of education corresponds to the difference between one degree level and the next, we find that the difference between a high school graduate and a college graduate on the average is $23 in the outcome of a job shift.

Verbal ability again reaches significance when education and other resource variables are kept constant. Verbal ability is scored on a scale from 0 to 9, and we may notice that one unit verbal ability returns $5.32 in income gains. Father's prestige is the only variable to reach significance among the measures of family background, however, it barely reaches significance.

Marital status has a relative effect close in rank to verbal ability. Its raw regression coefficient indicates that the difference between married and unmarried is $24.44 in the average income gain in favor of married persons. Our interpretation of the effect of marriage given in the analysis of prestige still applies. Marriage, it will be recalled, can be interpreted as a proxy for ability. It also may be argued to have a genuine effect.

Race is among the resource variables that fails to reach significance. Thus there is no significant difference in income gains between blacks and whites. With respect to prestige gains the effect of race also was modest. Race, accordingly, seems of minor importance for the outcome of the job transition in terms of income and prestige gains. In Chapter 3 it was shown that race ranked high among the variables affecting the probability of leaving a job. Blacks are less likely to leave their job, other things equal, than whites. In combination with the result of the present analysis this means that race acts primarily as a personal constraint. Blacks are less likely to take advantage of job opportunities than (when given the opportunity) whites, but when a job shift is engaged in, the outcome in terms of gains in occupational achievement do not strongly depend on race, holding constant measures of a person's resources.

We can compare the relative importance of resource variables for income gains as we did in the analysis of prestige gains. Table 4.4 gives the relevant statistics.

Table 4.4

Education again gets the highest rank for relative importance, regardless of which measure is used. The rank order of other variables is stable.

With respect to measures of personal constraints, it can be shown that age again fails to contribute to the amount of variance explained. Size of household does show a significant positive effect on income gains, contrary to our interpretation of this variable as a personal constraint, and contrary to our finding in the analysis of prestige gains. This effect of size

Table 4.4

The Relative Effect of Various Resource Variables on Gains in Income According to Three Alternative Measures of Effect.

	Measure of Effect		
Independent Variable	Zero-Order Correlation	Standardized Regression Coefficient	Unique Amount of Variance Explained (sq.root)
Education	.294 (1)	.079 (1)	.057 (1)
Marital Status	.271 (3)	.053 (2)	.047 (2)
Verbal Ability	.242 (4)	.050 (3)	.039 (3)
Labor Force Experience	.289 (2)	.032 (4)	.028 (4)
Father's Prestige	.166 (5)	.027 (5)	.022 (5)
Race	.123 (6)	.020 (6)	.017 (6)

Based on regression presented in table 4.3. Numbers in parenthesis refer to rank-order.

of household on the magnitude of the income gain shall be further explored in the canonical analysis of simultaneous gains in prestige and income, to be carried out below.

The calendar year is of quite high importance for income gains, higher, according to the t-value, than the importance of calendar year for prestige gains. Thus the overall increase in wealth in the period our cohort has been in the labor market seems of special importance for the gains in income realized in job-shifts -- even when wages are price-adjusted as in our analysis. It should be noted again that the use of calendar year as an indicator of the state of the economy ignores cyclical trends around the linear increase in wealth, and thus fails to indicate the effect of short-term variations in the state of the economy.

The partitioning of the variance given at the bottom of table 4.3 can be compared with the partitioning of variance for prestige presented in table 4.1. It is clear that the unique amount of variance explained by the prestige of the job left is lower than the unique amount of variance explained by income of the job left. Also, both total and unique amount of variance explained by all other variables, except the achievement of the job left, is lower in the case of income than for prestige. This might indicate that we do a poorer job of measuring resource variables in relation to income gains than we do in relation to prestige gains. If so, then the difference in the coefficient

x_{11} for prestige and income (.51 for income and .39 for prestige), may be due partly to the fact that income of the job left picks up more of the variance explained by unmeasured resource variables than is the case for prestige.

According to our discussion in section 4.1 there are three sources of variation in the magnitude of b_1 of equation (4.5), given that we do measure resource variables adequately. One source is the amount of control a person has over the decision to leave his job. Another is the distribution of job opportunities. Finally, random measurement error will affect b_1. The amount of control would be identical for prestige and income gains, so the difference cannot be due to this factor. With the information available it is impossible to separate out how much of the difference is due to a difference in the distribution of prestige and income opportunities and how much is due to a difference in measurement error.

It seems unlikely that the difference in b_1 is due to a difference in the amount of random measurement error in prestige and income, since this would indicate more error for prestige than for income. The above result could be due to a systematic bias in the reporting of income so that incomes are reported as "too" consistent over time. Such a bias may simply reflect the difficulty of recalling incomes over the long period of time covered in our interview. The result would be a high correlation of incomes across jobs, as we find, and a failure to measure actual variation in income that would have been related to our resource variables. Such a phenomenon seems less likely to occur in the measurement of prestige variation, since prestige was assigned in the data-processing on the basis of the reporting of occupational titles -- easier, no doubt, to recall than earnings. Stated otherwise, prestige does not reflect a self-report of the status of jobs held. This difference in the validity of the reporting of our two measures of occupational achievement may explain the results discussed above, both the difference in b_1 and in the amount of variance explained by resource variables.

4.3.3 Canonical analysis of gains in occupational achievement.

Analyzing gains in prestige and income separately conceals the fact that individuals may be assumed to maximize both simultaneously. It is desirable therefore to be able to deal with gains in both prestige and income. Canonical analysis is a suitable technique for this purpose and we shall apply it here to the total sample of transitions.

Canonical analysis will enable us to use gains in prestige and income as dependent variables in an equation that includes measures of resources and previous income and prestige. This analysis will give a set of coefficients to the variables that maximize R^2 between the two sets of variables, just as multiple regression gives the set of coefficients that maximize R^2 between a single variable and a set of variables.

Income and prestige may be seen to determine one dimension of the desirability of a job, occupational achievement. Canonical analysis gives several solutions. These solutions are orthogonal to each other and may be seen as reflecting the dimensions of the dependent phenomenon. Which dimension of desirability we obtain may be determined from the signs and magnitudes of the coefficients. Occupational achievement, as a sum of prestige and income, should be one of the dimensions.

With two dependent variables there are two solutions. The solutions are presented in Table 4.5. The coefficients can be interpreted as standardized regression coefficients.

Table 4.5

The two solutions give multiple correlations of .76 and .51. The coefficients to prestige and income for the largest canonical correlation are both positive. This is then the solution for the maximization of occupational achievement. The coefficients to the independent variables overall conform to the pattern found in the analysis of prestige and income separately. The dominating relative importance of education may be noted.

While the largest canonical correlation gives a solution that reflects the effect of resource and other variables on occupational achievement as a sum of prestige and income, the second solution has coefficients for income and prestige with opposite signs. This solution may be interpreted as a characteristic of

Table 4.5

Canonical Analysis of Gains in Prestige and Income

	Solution 1	Solution 2
Canonical Correlation (R_c)	.75	.51
I. Dependent Variables	Canonical Weights	
Prestige	.55	.93
Income	.65	- .86
II. Independent Variables		
A. Returns:		
Prestige of job left	.32	.62
Income of job left	.52	- .88
B. Resources:		
Education	.22	.30
Verbal Ability	.09	.05
Labor-Force Experience	.07	.04
Race	.04	.05
Father's Prestige	.07	.08
Father's Education	- .01	.00
Mother's Education	- .01	- .02
Number of Siblings	.02	.00
Marital Status	.08	.00
C. Constraints:		
Size of Household	- .03	- .10
C. Other:		
Calendar Year	.11	.07
Move	.03	.08

jobs: excess prestige over income. A positive effect of an independent variable under this solution reflects the fact that the variable in question influences the extent to which prestige relative to income is maximized. A zero effect indicates a balanced effect, and a negative effect tells that the independent variable leads to maximization of income over prestige. In other words, the effect of independent variables reflects the degree to which low income - high prestige jobs are sought out in the job transition.

Inspection of the coefficients in the second solution in table 4.5 shows that resource variables that previously were found to be significant (tables 4.1 and 4.3) contribute positively to the maximization of prestige over income. The exception is marital status which has a balanced effect. Thus the higher a person's resources, especially his education, the more willing he seems to be to forego some income for additional prestige gains.

Size of household has a negative and relatively large effect under the second solution. This means that with increasing size of household the respondent seems more likely to forego prestige for income. We found in the previous section that size of household had an unexpected significant effect on gains in income. Large households were found in Chapter 3 to reduce a person's willingness to engage in job shifts. Our finding in this Chapter indicates that when persons with large households do engage in job shifts they seek out jobs which have a high return in income and are willing to forego some prestige in the process. Thus size of household, in addition to reducing a person's willingness to shift jobs, affects the type of job (high income-low prestige jobs) that he eventually seeks out.

4.4 Level of occupational achievement.

The analysis of gains in income and prestige has treated every job transition as a unit of analysis. This may appear a peculiar sample, and the usefulness of inferences drawn from an anlysis of this sample may be questioned. The analysis of gains in occupational achievement, and prior to that, the analysis of the decision to leave a job, was done in order to analyze the mechanisms that produce a given level of prestige and income. A direct analysis of the level of achievement, at a given point in time, should give results consistent with the results of the analysis of job shifts. In order to establish whether this is in fact so, and in order to explore the consequences of the choice of unit of analysis, this section will briefly analyze the level of occupational achievement in relation to the independent variables used above.

An analysis of the level of occupational achievement could be performed in several ways. One method would be to choose a set of age-points and perform separate analyses at each point in time. This would lead to a loss of information, as we would only use information on achievement at some points in time. To utilize all information would demand that separate regressions be performed for every month our sample had been in the labor force -- an overwhelming task. An alternative way would be to use jobs as units of analysis, but to weight each job by its duration. This would give the same results as an analysis of achievement in every month, if it is assumed that occupational achievement is constant as long as a person is in a job. The validity of this assumption has been discussed in Chapter 3. Granted this assumption, the weighting procedure would enable us to analyze achievement as a characteristic of individuals and still utilize all information on achievement contained in our data without having to engage in an enormous data-handling task.

The result of such an analysis is given in table 4.6. The multiple regression analysis was carried out on the sample of all jobs, where each job was weighted by its duration. Also presented in table 4.6 are the results of a regression analysis with jobs as units of analysis without weighting. This is done in order to evaluate the consequences of shifting from one unit of analysis to another. Table 4.6 gives raw regression coefficients and t-values. The t-values may be used to evaluate the relative importance of independent variables.

Table 4.6

Table 4.6

Summary of Regressions of Income and Prestige Level on Individual Characteristics

	Prestige			Income		
Independent Variables	Raw Regression Coefficient		t	Raw Regression Coefficient		t
Resources:						
Education	35.93	(32.11)	27.08	29.33	(19.23)	10.54
Verbal Ability	8.15	(8.56)	9.82	16.08	(13.06)	9.25
Father's Prestige	.11	(.10)	8.95	.07	(.07)	2.63
Race	39.36	(34.28)	7.19	80.34	(50.74)	8.88
Labor Force Experience	- .11	(.14)	2.30	.43	(.35)	4.23
Marital Status	18.02	(18.28)	4.79	35.16	(34.20)	4.45
Mother's Education	.41	(1.68)	.33	3.16	(7.27)	1.22
Father's Education	3.17	(.74)	2.79	-5.10	(-6.42)	-2.13
Number of Siblings	.60	(.49)	1.21	.97	(.44)	.46
Personal Constraints:						
Age	.18	(.16)	3.17	- .16	(.28)	1.35
Size of Household	.27	(-1.64)	.38	8.83	(6.21)	5.73
Structural Constraints:						
Calendar Year	3.75	(2.42)	1.94	12.45	(7.48)	12.56
R^2	.43	(.38)		.24	(.26)	

Based on weighted observations. Number in parentheses are from equations based on unweighted observations (see text).

In line with results of earlier analyses we find that education is a dominant resource variable, both with respect to income and prestige level, but especially in relation to the latter.

The effect of an independent variable on the level of occupational achievement is a function of the effect of this variable both on the decision to leave a job, and on the gain in achievement, when a job shift is performed. Even if a variable has no effect on the gains realized in job shifts, it may still be found to have a relationship to the level of achievement. This would occur when the variable in question affects the probability of leaving and thus a person's willingness to take advantage of job opportunities. Such a situation would explain why race is found to rank relatively high among the independent variables for level of achievement, even though race did not have a strong effect on gains realized in job shifts. Blacks are less likely to take advantage of job opportunities (as we found in Chapter 3), and this factor reduces their income and prestige in relation to whites, even though gains realized in job shifts are not very different for blacks and whites.

Measures of personal constraints are variables that have no effect on the returns from job shifts but reduce a person's willingness to shift jobs. These variables therefore should have a negative relation to level of achievement. This prediction is not convincingly borne out for our constraint variables, age and size of household. Size of household does not have a significant effect on level of prestige, and has a significant, positive effect on level of income. The relation to income reflects the impact of size of household on the type of jobs sought out in job shifts (high income-low prestige jobs), that we detected in the canonical analysis above, an effect that seems to override the effect of size of household on the probability of leaving.

Age has a negative, but not a significant effect on level of income, and a positive effect on prestige. The latter contradiction of our expectations can possibly be explained by the high intercorrelations among age, labor force experience and calendar year. We find a negative effect of labor force experience, contrary to its classification as a resource variable. Because of the high intercorrelation among the three time measures, a slight change in the intercorrelations would reverse the signs, so that our predictions would be confirmed both for age and labor force experience. In addition, we shall argue below that the introduction of age in the equation produces an interaction effect. This would also affect measures of the effect of age in table 4.6.

The results based on unweighted observation are overall quite similar to the ones obtained from weighted observations. The choice of unit of analysis does not affect our results greatly. It can be noted that in many instances the raw regression coefficients are larger for the weighted observations. This reflects the fact that among unweighted observations, short jobs are equal to long jobs. But we found in Chapter 3 that the higher a person's resources relative to his achievement, the more likely he is to leave his job. It follows that the discrepancy between resources and achievement will be greater for shorter jobs. When using unweighted jobs as units of analysis, the covariation between resources and achievement therefore can be expected to be lower than when weighted observations are used, since the short jobs with low covariation will dominate.

The relation between duration of jobs and the degree of association between resources and achievement also accounts for the increase in R^2 as a result of the weighting in the prestige equation. Such an increase is not found for income. The reason is that we also may increase measurement error in income as a result of the weighting, since only one income figure, mean income, is used. A variation within jobs in income is more likely for long jobs, and when we weight observations these jobs will dominate, but be counted as though income had been constant. The increase in measurement error produced by the weighting will offset the increase in R^2 produced by the weighting. Since raw regression coefficients are not dependent on measurement errors in the dependent variable we do obtain the expected increase in those coefficients also for income.

The fact that short jobs tend to be held by younger persons also contributes to the effect of the weighting. The reason is that the mean gain per job shift is positive and a function of a person's resources. Older persons will have more job shifts behind them than younger persons, and not only will their mean achievement therefore be higher, but also the covariation between resources and achievement will be higher, since every gain experienced is a function of a person's resources. When (unweighted) jobs are units of analysis, jobs held when respondents were younger will dominate, since short jobs count equal to longer ones. When weighted observations are used, jobs held when respondents were older will dominate. This is an additional reason for the results obtained above in the comparison between weighted and unweighted observations.

The increased covariation between resources and achievement produced by job shifts implies that age will produce an interaction effect when introduced in an equation where other independent variables are measures of resources. This can be demonstrated directly by performing regressions as in table 4.6 in different age groups. The results of such an attempt are presented in table 4.7a and 4.7b.

Table 4.7a and b

As a person gets older we find an increase in the effect of independent variables and an increase in R^2. This result is in accordance with our finding that the average gain in a job shift

Table 4.7a

Regression of Prestige on Individual Characteristics in Three Age Groups

	Raw Regression Coefficients		
	Age Group		
Independent Variable	I	II	III
Resources:			
Education	11.06	38.22	39.07
Verbal Ability	4.64	7.80	8.58
Father's Prestige	.06	.03	.16
Race	27.31	61.44	34.81
Labor Force Experience	- .20	.19	- .16
Marital Status	-8.69	16.14	33.06
Mother's Education	4.25	3.31	- .56
Father's Education	4.55	4.81	-7.53
Number of Siblings	- .76	2.16	.26
Personal Constraints:			
Age	1.13	.36	.22
Size of Household	.28	-2.58	- .04
Structural Conditions:			
Calendar Year	.54	.78	- .17
R^2	.24	.36	.42

Note: Mean age in age groups is 20, 25 and 33 years respectively.

Table 4.7b

Regression of Income on Individual Characteristics in Three Age Groups

Independent Variable	Raw Regression Coefficients Age Group I	 II	 III
Resources:			
Education	4.16	11.14	46.70
Verbal Ability	5.93	11.64	28.74
Father's Prestige	.04	.11	.12
Race	63.01	59.87	102.27
Labor Force Experience	.32	.35	.54
Marital Status	-28.59	53.35	110.20
Mother's Education	24.50	6.13	-2.25
Father's Education	-17.78	-5.47	-6.99
Number of Siblings	2.61	.22	1.65
Personal Constraints:			
Age	1.44	.24	.03
Size of Household	3.50	3.94	6.81
Structural Conditions:			
Calendar Year	4.73	9.50	15.43
R^2	.10	.12	.19

is positive and determined by a person's resources. The results are over all similiar to earlier ones, but it may be noted that the partial effect of marriage is negative for the youngest age group and increasingly positive for the older age-group. Marriage is apparently a constraint for the youngest, but an asset later in life.

The R^2 increases with age for both prestige and income. It can be seen that the R^2 in each age group is below the overall R^2. We would have expected a larger R^2 in age groups, because of a better fit of the linear equation when the age-interaction has been removed. The present result reflects the restriction in the range of variation in calendar year produced by the age-grouping. Calendar year, as an indicator of the general state of the economy, is an important variable for income, but not for prestige. For prestige, therefore, the R^2 in each age group is not below the overall R^2.

The results presented in table 4.7 will be obtained if there are constant returns to resources in each job shift, independent of a person's age, or if the returns are increasing with age. By pooling all job shifts in the preceding section we have performed our analysis as though returns were independent of age. This would seem a reasonable assumption, since it was found that age had no unique contribution to the amount of variance explained in the total sample of job shifts. However, a direct analysis of whether there is a relation between age and the return on resources obtained in job shifts would be desirable. This will be deferred until the next chapter.

In the next section we return to the analysis of job shifts in order to establish how the occupational structure modifies the gains in job shifts.

4.5 Impact of structural characteristics.

The results presented so far provide only a weak test of the reasoning that resulted in the model equation (4.5) and the interpretation of the parameters of this equation. We have shown that measures of a person's resources indeed are related to gains in occupational achievement. This confirms one of our basic assumptions, but the verification of this assumption is not surprising and the assumption is in itself hardly a conceptual innovation. The main part of section 4.1 dealt with how characteristics of the occupational structure modify the outcome of job-transitions. An empirical investigation of this impact of structural characteristics is needed in order to validate the interpretation of parameters in equation (4.5), and thus the main theoretical argument of this chapter.

The individual's perceived control over the decision to leave a job shall be used as our main criterion of validity. The reason for this choice is obvious in view of the argument of section 4.1. It will be recalled that we described two situations: one in which the individual has full control over the decision to leave, another in which he has no control.

In the first situation individuals are expected to realize a gain in job shift determined by their resources, since a person should leave his job for a new one only when a gain corresponding to his resources is possible. When a person has no control over the decision to leave he is expected to suffer a loss, the magnitude of which is dependent on the achievement of the job left. Formally the outcome of the job shift was expressed as (cf. equation 4.5):

$$x_1 = b_o + b_1x_1 + b_2x_2$$

where

$$b_1 = (1 - c)d_1 + e \tag{4.7}$$

and

$$b_2 = ca_2$$

The parameter d_1 is a measure of the extent to which the availability of vacant jobs depends on the occupational achievement level. The amount of control an individual has over the decision to leave is expressed by c, assumed to vary between 0 and 1. The parameter a_2 gives the effect of a person's resources on the gains realized in job shifts, and e denotes the impact of measurement error on b_1.

The interpretation of the parameters in (4.7) was arrived at through an argument that took as the basic assumption that the gains realized in job shifts depend on the amount of control over the decision to leave a job. This reasoning can be tested by comparing the actual gains in achievement when the job is left voluntarily to the gains experienced when the person had no control over the decision to leave. This test is given in table 4.8.

Table 4.8

Our initial assumptions were that when persons have control over the decision to leave, they will tend to experience a gain, and when they have no control they will experience a loss. These assumptions are validated insofar as the magnitude of the gain does vary with the reported control over the decision to leave. Where the job was left involuntarily, an actual average loss of income is observed; for prestige, only a small gain is found for the job transition.

Since our argument concerned occupational achievement and not prestige or income in isolation, we would like to combine income and prestige to produce an overall measure of achievement. The desired weights for such a combination of prestige and income are given in table 4.5. They are the coefficients to prestige and income for the first canonical correlation -- the solution for the maximization of occupational achievement as a sum of prestige and income. Using these weights we obtain the results presented in the third row of table 4.8. When the job is left voluntarily a gain in occupational achievement is experienced; when the job is left involuntarily an actual

Table 4.8

Mean Prestige and Income and Mean Gains in Prestige and Income According to Stated Control over the Decision to Leave.

	Own Decision	Not Own Decision
Mean Prestige	336.59	288.35
Mean Gain Prestige	20.26	1.47
Mean Income	397.96	378.79
Mean Gain in Income	28.39	-11.96
Mean Occupational Achievement	369.83	325.40
Mean gain in Achievement	24.66	- 5.80
N	3179	689

Note: Occupational achievement computed as a weighted average of income and prestige with weights obtained from the canonical analysis presented in Table 4.5.

loss in occupational achievement is observed. The result is influenced by measurement error in two ways. Measurement error in stated control would appear to decrease the difference in gain between the two groups. Measurement error in prestige and income would also decrease the difference. The latter result is caused by regression toward the mean. If only measurement error was operative, the group with no control would experience a larger gain than the other group due to the difference in mean achievement of the two groups.

A direct test of the interpretation of b_1 of equation (4.7) as a measure of the impact of structural characteristics can be given by a least square estimation of b_1 for those job transitions where it was the individual's own decision to leave the job, and a similar estimation for the transitions where the job was not left voluntarily. The results are presented in table 4.9. The estimates are obtained from an equation where the independent variables are the same as in tables 4.1 and 4.3, but the dependent variable is the actual difference Δx_1. In other words equation 4.7 is estimated directly except for the expansion of x_2 as a set of variables.

Table 4.9

For both prestige and income b_1 varies in the expected direction. For those transitions where the individual claims to have had control over the decision to leave, b_1 is larger

Table 4.9

Raw Regression Coefficient of Income and Prestige of Job Left on Gains in Achievement According to Stated Control over the Decision to Leave Job

	Prestige	Income
	b_1	b_1
Own Decision	-.58	-.38
Not Own Decision	-.65	-.40
N	3179	689

than for the remaining transitions. When a job is left involuntarily, the achievement of the job left has a higher (negative) impact on the outcome of the job transition than in the case where the job is left voluntarily. Thus when a person leaves involuntarily he is more dependent on the relation between availability of vacant jobs and occupational achievement, as we argued in section 4.1. The difference is, however, modest for prestige and minimal for income. We thus have quite weak support for our model.

The magnitude of b_1 is determined by c, d, and errors of measurement. The importance of either of those three factors is difficult to estimate with the information available. A further analysis of the reasons for the weak support for the model (4.7) given by table 4.9 therefore is not feasible. We will have to conclude that b_1 according to table 4.9 at least varies in the expected direction, although the difference is small between those who claim to have had control over the decision to leave and those who did not.

It is desirable to supplement the above attempt to validate the model (4.9). An alternative approach was suggested in section 4.1. It was argued that the amount of variance explained by a person's resources is a measure of the amount of control over the decision to leave. The rationale is, that if a person has full control over the decision to leave, $b_1 = o$ and b_2 will be at a maximum (determined by a_2 in equation 4.12); but when

$b_1 = 0$ no variance will be explained by achievement and the amount of variance explained by resources will equal the total amount of variance explained in equation 4.7. If there is no control ($c = 0$) then $b_2 = 0$, and no variance will be explained by a person's resources. An alternative way of validating the reasoning leading to equation 4.7, then, is to partition the amount of variance explained between achievement and resources for those who have and those who do not have control over the decision to leave.

The reformulation of equation 4.7 already given in section 4.3 (equation 4.6) proves advantageous. To restate the reformulation

$$x_{12} = b_1^* x_{11} + b_2 x_2 \qquad (4.8)$$

where $b_1^* = 1 + b_1$

and $b_2 x_2 = \sum_i b_i x_2$

In this equation resources and achievement of the job left will all have an effect in the same direction on the dependent variables. The suppressor effect is avoided and the partitioning of the variance described above is appropriate.

The statistics corresponding to equation (4.8) are given in table 4.10.

Table 4.10

Table 4.10

Amount of Variance Explained by Prestige and Income of Job Left and Resources, by Stated Control over the Decision to Leave Job

	Prestige	Prestige Resource Variables	Equations All Variables	Income	Income Resource Variables	Equations All Variables
Own Decision						
Unique	.107	.075		.271	.036	
Total	.388	.360	.467	.468	.233	.504
Not Own Decision						
Unique	.090	.117		.237	.031	
Total	.249	.276	.366	.385	.179	.416

The total amount of variance explained is in fact the most adequate measure of the amount of control over the decision to leave. As individual's control over the decision to leave increases, the effect of x_{11} increases as well as the effect of resources. This means that reported control over decision to leave should discriminate between groups with different overall total R^2. This prediction is borne out: there is a .08- .10 difference in R^2 between those who left their job voluntarily and those who did not. The same pattern will be found, with one exception, for the various ways of partitioning the variance. Overall we seem to have obtained a validation of the model for gains in occupational achievement.

The difference between the overall R^2's is significant at the .95% level. Confidence intervals were computed using the method described in Chapter 3. For those who left on their own decision, we obtain for prestige equations an R^2 of .47 ± .02 and for income .50 ± .02. For those who left involuntarily, we obtain for prestige .37 ± .06 and for income .42 ± .05.

The conclusion based on Table 4.10 should be qualified in two ways. First, R^2 will depend on measurement errors as well as on the relative effect of variables. We therefore must assume again that measurement errors do not depend on the amount of control. Second, the effect of resources is dependent not only on c but also on a_2 , that is, the conversion rate between resources and gains in achievement. The above conclusion is only valid if a_2 is approximately the same for the two groups of transitions. This may not be true if in different parts of the occupational structure our resource variables do not consitute the same measure of a person's value in the job market, and if the occupational distribution is very different for those who have and those who do not have control over the decision to leave.

We shall conclude our analysis of the impact of structural characteristics by analyzing the variation between industries as in chapter 3. We could do so by analyzing the variation in R^2 from equation (4.7) separately for prestige and income. However, it can be shown that there will be a variation in R^2 between industries for either one of the two achievement variables that only can be explained by a difference between industries in the extent to which prestige rather than income (or vice-versa) is maximized in job shifts. The canonical correlation method proves advantageous here as we can study the gains in income and prestige simultaneously. The largest canonical correlation was shown in section 4.3 to be the one for maximization of occupational achievement and is given in Table 4.11 together with the unemployment rates.

Table 4.11

Table 4.11

Canonical Correlations between Prestige and Income of Job Entered and Individual Characteristics and Prestige and Income of Job Left in Different Industries and Unemployment Rates.

Industry	R_c	Unemployment Rates
Agriculture	.78	2.8
Construction	.71	9.6
Manufacturing:		
Durable Goods	.73	12.6
Non-Durable Goods	.79	6.2
Transportation	.69	6.9
Wholesale and Retail	.81	5.7
Finance, Insurance	.81	4.3
Services	.78	5.4
Public Administration	.83	4.9

As in Chapter 3 we shall assume that measurement error affects the results equally in all industries. We predict an association between the canonical correlations and unemployment rates because the forces that produce variation in the canonical correlation should also affect unemployment rates. These forces are the amount of control over the transition process, and for a given level of control, the variation in d_1 of eq. (4.7) due to a variation in the availability of vacant jobs.

The method employed in Chapter 3 to reduce the impact of differential variability of the canonical correlation, i.e. z transformation and weighting by size of industry, was used in computing the correlation between unemployment rate and R_c. The correlation is .67. This is significantly different from zero at the .025 level, but not as satisfactory a result as we obtained in Chapter 3. The correlation between the measure of the impact of structural characteristics developed here and R^2 of Table 3.5 from Chapter 3 is only .40. This is a disappointing result. Part of the different is due to a large discrepancy for one industry: transportation.*

The result of the study of variation between industries may be affected by a difference in d_1 of equation (4.7) due to a difference in the shapes of occupational structures between industries. c.f. our discussion in section 4.1. Also,a difference in the validity of measurement of a person's resources between industries affects our results. Further interpretations, however, would be purely speculative.

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* Deleting that industry we obtain a correlation of .74.

4.6 Conclusion

The preceding chapter demonstrated that people leave jobs when a further gain in prestige and income appears possible. This anticipated gain is a function of a person's resources. This chapter has demonstrated that the actual returns on job shifts are related to a person's resources.

Our analysis has been based on a simple linear model in which gains in occupational achievement are seen as dependent on a person's resources. Characteristics of the occupational structure modifies gains in two ways. The amount of pressure to leave a job affects the gain through its impact on a person's control over the decision to leave a job. Given the amount of control, the availability and distribution of vacant jobs determine the outcome of the job transition. If a person has no control over the decision to leave, he is expected to suffer a loss in prestige and income, since if a better job has been available, he should have left his job before he was forced to leave involuntarily. The loss (or the modification of the gain, in case he has some control) will be dependent on the availability and distribution of vacant jobs. The lower the availability and

and the more unevenly distributed they are, the higher the loss.

The data analysis first focused on the relative contribution of individual characteristics to gains in income and prestige. The variables identified as resource variables in Chapter 3 show the expected positive effect on gains. These variables are education, ability, labor force experience, and marital status. The only family background variable that has a significant, unique effect is father's occupational prestige. In contrast to the finding of Chapter 3, race does not have a strong impact on gains in achievement. This seems to indicate that race acts as a personal constraint as much as a resource. Blacks are less likely to shift jobs, but once they do engage in job transitions their gains are only moderately different from the ones realized by whites.

The measures of personal constraints identified in Chapter 3 were age and size of household. The interpretation of age as a constraint was verified here, as age has no unique contribution to gains in income or prestige. Size of household does, however, show a significant contribution to gains in income, although not to gains in prestige. It was demonstrated through canonical correlation analysis that this result reflects the fact that size of household is conducive to the choice of a certain kind of job, i.e. high-income - low prestige jobs.

The calendar year in which the job shift took place was demonstrated to be related to gains in prestige and income, especially to gains in income. This finding indicates that the greater wealth of the nation benefited those who changed jobs later in the period in which our cohort have their work-histories.

The relationship between the set of independent variables used previously and the level of occupational achievement was analyzed next. This anlysis was made with the individual as a unit of analysis by weighting every observation by the duration of the job. It was shown that the choice of the unit of analysis does not affect the results greatly, and that the relationships between the various individual characteristics and the level of occupational achievement were consistent with the results of earlier analyses in this and the preceding chapter. This section also demonstrated that the covariation between resources and occupational achievement increases over time. The interaction effect with age follows from the fact that older people have more job shifts behind them than younger people and that job shifts give an increase in occupational achievement -- a gain that is determined by a person's resources.

The analysis of the impact of structural characteristics attempted in various ways to identify the contribution of various sturctural factors to the modification of gains in income and prestige. It was demonstrated that the best overall measure of the impact of structural characteristics is the amount of variance explained by the income and prestige of the job left, and the individual characteristics. This result was obtained by analyzing the difference between jobs where it was, and was not, the individual's own decision to leave the job. The amount of variance explained showed a significant relation to unemployment rates, although the covariation is not as high as the one found in Chapter 3.

SUMMARY AND CONCLUSION

5.1 Summary

Our study has taken as a point of departure an important problem in the field of social mobility research, as this research traditionally has been carried out. The problem is that the data most often used are data on intergenerational mobility, and these data do not give the necessary information to implement a conceptualization of mobility, where mobility is seen as a function of individual and structural characteristics. Since intergenerational data do not permit precise measurement on the mobility process, and typically only give scarce information on variables associated with the process, the separation of structural and individual causes of mobility is hindered; unsatisfactory measures and models and meager theory result.

Life-history data are an alternative to intergenerational data that provides much more satisfying information in view of the objectives of mobility research. The life-history data available to us were rich in detail on individual events and characteristics, but only gave data on a relatively small sample of a single cohort. It is therefore natural to use these data to analyze the process through which individuals achieve a certain level of prestige and income. Substantively, this has been the aim of our study, with special emphasis on making inferences about the importance of individual as well as structural characteristics. Methodologically, the objective was to develop a method of analysis for life-history data that made most efficient use of the wealth of information given on changes in variables over time and the interrelationship of these changes.

The analysis of the achievement process focuses on changes in prestige and income over time. It was argued that the form of analysis will depend on whether changes in achievement are conceptualized as continuous or as discrete, i.e. whether the changes are assumed to take place only at certain intervals or continuously. Which of these conceptualizations is the most appropriate empirically depends on the amount of variation within a job in income and prestige. With our operationization of a job, a variation within jobs in prestige cannot occur, and a variation in income not caused by a secular increase in real wages is of less importance. It therefore seems most appropriate to assume that all changes in occupational achievement take place in conjunction with job changes. This means that an analysis of job shifts has been central to our study. The prestige and income level at a given point in time will be a function of the gains realized when shifting jobs, and the number of job shifts undertaken. The analysis of the decision to leave a job and the analysis of the outcome of this decision, therefore, formed the two major tasks to be undertaken.

The dependent variable in the analysis of the decision to leave a job is the probability of leaving a job. An expected age-dependency, hence time-dependency, in this probability created a serious problem. The probability of leaving governs the duration of jobs, and could be estimated from the durations had this probability been constant in time. A transformation of time through the concept of psychological time enabled us to take the time-age dependency of the probability of leaving into account and form the desired dependent variable.

To generate explanations and hypotheses regarding the achievement process we started from the basic assumption that individuals maximize occupational achievement. This means that they will leave the job held when it is advantageous to do so. Their possibility of gaining prestige and income will be determined by their resources, (education, family background, ability), i.e. the characteristics that determine a person's value in the job market. It follows that for a given level of occupational achievement, the greater the resources the greater the likelihood that a person will leave his job. Conversely, controlling for a person's resources, the higher the income and prestige of a job, the smaller the probability of leaving.

These hypotheses were verified by demonstrating that the signs of the partial regression coefficients were opposite for resource and achievement variables in a regression equation where the probability of leaving is the dependent variable. Age was introduced in this equation to take care of the time dependency of the probability of leaving, and it has a strong negative effect. This might be interpreted to mean that age is a negative resource. However, we argue that it seems more appropriate to consider age as a member of a third group of variables, (besides resources and achievement), that we call measures of personal constraints. These are variables that affect the probability of leaving only, without affecting a person's value in the job market. Other than age, size of household and ownership of house were shown to have the predicted negative effect on the probability of leaving as measures of personal constraints.

The discrepancy between resources and achievement will only explain the decision to leave a job to the extent that individuals are in control over the decision to leave. Other factors that will influence the probability of leaving are those that determine the supply of vacant jobs and the pressure to leave a job. These structural characteristics are not measured directly with our data. Their influence therefore affects the amount of variance not explained in the probability of leaving by resources, achievement and personal constraints. This assertion was verified by showing that there was a significant difference in R^2 according to whether the person stated that he left the job voluntarily or not. Also, it was demonstrated that R^2 in the equation with individual characteristics varied with unemployment rates in different industries. Unemployment rates were hypothesized to vary with the same structural characteristics that influence the decision to leave a job.

Having analyzed the decision to leave, the next task was to analyze the outcome of the job shift in terms of the gains realized in prestige and income. A simple linear model was proposed in which gains are a function of a person's resources, but are modified by the impact of structural characteristics. The structural characteristics, in particular the pressure to leave a job, determine a person's control over the decision to leave a job. The amount of control is important for the degree to which the jobholder is dependent on the availability of jobs. If a person has full control his gain in prestige and income will be at a maximum and will not depend on the employment situation, whereas if he has no control, he is expected to suffer a loss in the job transition, the magnitude of which will be determined by the availability of jobs. The overall impact of the structural characteristics is therefore to modify the gain that otherwise would be predicted from a person's resources.

The first part of the analysis of the outcome of job transitions focused upon the relative contribution of the various resource variables (education, ability, family background, and labor force experience) and tested the interpretation of several variables (age, size of household) as measures of personal constraints. The interpretation of age as a personal constraint was verified by showing that although age has a strong impact on the probability of leaving a job, it has no unique effect on gains realized in job transitions. Size of household did have a significant effect on gains in income, contrary to interpretation of this variable as a personal constraint. Through canonical analysis, where simultaneous gains in income and prestige can be studied, it was shown that this result reflects the fact that a large household leads to a preference for a certain kind of job -- one with high income and low prestige.

The next section of chapter 4 focused on the age variation in levels of achievement due to job shifts. The level of achievement at a given point in time is a function of the number of job shifts undertaken and the outcome of these job shifts. We demonstrated that the average job shift produces a positive gain in prestige and income. The magnitude of this gain is determined by a person's resources. It follows that as a person gets older his level of achievement will increase as well as the association between achievement and resources. The implications of these results of the study of job shifts was studied next in chapter 4.

The analysis of the age variation in level of achievement should be performed with individuals as the unit of analysis. All information in achievement, however, was recorded with the job as a unit. The most efficient use of this information that would give individuals as units was to weight each job by its duration. Using this procedure the desired analysis of the level of achievement was carried out. This analysis yielded a relationship between individual characteristics and achievement consistent with the results of the analysis of job shifts. The predicted age increase in the association between resource variables and prestige and income also found support in this analysis.

In the second section of chapter 4, the interpretation of the model for gains in job transitions was tested further in an attempt to verify the way in which gains are modified by structural characteristics. A person's stated control over the decision to leave was again used as a criterion of validation. It was demonstrated that the amount of variance in the prestige and income of the job entered that can be explained by a person's resources gives the most satisfactory measure of the impact of structural characteristics. This measure was shown to be significantly related to unemployment rates in different industries, although the association was not quite so high as the one found when the impact of structural characteristics on the probability of leaving was analyzed in chapter 3.

The main results regarding the relative importance of variables can be briefly summarized. Among the resource variables, education stands out as the dominating variable in all phases of the mobility process. Family background measures emerge with only a modest effect on the process. This result might be attributed to the simultaneous introduction of several family background measures, with the result that these measures to some extent partial each other out.

Race was shown to have a quite high effect on the probability of leaving -- whites changing jobs more often than blacks -- but only a modest effect on the return on job transitions. This seems to indicate that race primarily acts as a personal constraint, so that blacks are less likely to be given or to take advantage of new job opportunities.

An interesting result due to the use of longitudinal data on one cohort is the relatively high effect of calendar year as an independent variable. This result was interpreted to reflect the overall expansion of the economy in the period in which our sample has compiled its life histories. This effect is produced both by an increase in job opportunities demonstrated in chapter 3, and a greater gain, other things equal, late in the period, demonstrated in chapter 4.

5.2 The Achievement Process as a Social Indicator

This life history study was undertaken as part of a larger research program concerned with "social accounts." The aim of the larger program is to develop a system of accounts to measure levels of various resources that may be used as inputs to produce desired output resources. The social accounts program also tries to ascertain how input resources are converted into output resources. The overall framework is a theory of social change, where change occurs through the conversion of resources of one type (such as power, education, trust) into resources of another type (such as income, prestige and freedom of action) [see Coleman 1971]. It seems appropriate to discuss some of the implications of the preceeding analysis for such an endeavor.

The substantive objective of this inquiry has been the analysis of how a certain level of prestige and income is achieved. The nature of our data made it natural to focus especially on the impact of individual characteristics for such achievement. Our results tell us how various personal resources such as race, education and family background are converted into prestige and income through job shifts. We have argued that the conversion process can be broken into two parts, where one is the decision to leave a job, the other the outcome of the job shift in terms of income and prestige gains. In other words, the level of prestige and income is seen as a result of a set of job shifts, and is determined by their frequency and outcome.

The conversion of individual resources into occupational achievement has been established in other research on larger samples and hence with more statistical precision -- for example, in the study by Blau and Duncan (1967). Our study augments these previously obtained results in several ways.

We have used a larger array of personal resource variables than previous studies. Not only did we establish the impact of education and family background, but also the importance of such characteristics as marriage, labor force experience and verbal ability. The consequence is that we have increased the alternatives from among which to choose the specific resources to be classified into a system of social accounts. The use of life-history data and the use of job shifts as a unit of analysis enabled us to locate the achievement process precisely in time and therefore to establish the causal influence of a broad set of characteristics and events.

The conversion process was broken into two parts: the decision to leave a job and the outcome of job shifts. The level of achievement is determined by effects of individual characteristics on both parts of the process. However, we have shown that a given characteristic does not necessarily bear the same relationship to both phases of the job shift. Age, for example, strongly affects the decision to leave but not the outcome of the job shift. The difference between white and black was more important with respect to the likelihood of shifting job than it was with respect to the outcome of job shifts. The policy implications of such findings are that one may affect differentially the likelihood of shifting job and the opportunities for realizing gains in occupational achievement.

The analysis of job shifts has made it possible to infer the importance of characteristics of the occupational structure for the achievement process. We have argued that the distribution of job opportunities and the level of employment affect the decision to leave a job as well as the outcome of the job shift. Although no direct measurement of these characteristics was available, we were able to develop indirect measures of structural characteristics that have some validity. This appears to be an important addition to our understanding of the conversion of personal resources into prestige and income. Since this process is affected by the distribution of opportunities and the employment situation, it follows that an attempt to produce change through a change in personal resources will be conditioned by changes in occupational structure. The economic factors that determine employment conditions are not controlled by the policies that affect the levels of personal resources. Hence the success of programs to change the occupational achievement of a subgroup through change in their level of resources is dependent on the ability to take into account the way in which structural factors will influence the mobility process.

Previous research on occupational achievement ignores the influence of structural characteristics. The parameters given for the conversion process are, therefore, determined to an unknown extent by the specific employment conditions prevailing at the time of study. Consequently, the usefulness of such parameters for an attempt to develop a system of social accounts is quite limited. The present analysis has provided a start toward the specification of the way in which availability of job opportunities modifies the transformation of occupational resources into occupational achievement. Further work in this direction seems desirable in order to develop models of the achievement process that will be useful for creating social change in a desired direction.

5.3 Concluding Remarks

Our substantive objective was to analyze the occupational achievement process. We attempted to meet this objective by giving an analysis of careers that focused on job transitions, since most of the variation in careers can be attributed to the outcome and frequency of job shifts. Our result is the beginning of a theory of careers that may explain why people shift jobs, and what they gain by doing so. The empirical analysis has given some insight into the impact on the career of various characteristics of the individual such as education, age, race and family background.

Throughout the analysis, special emphasis also has been placed on studying the importance of the occupational structure and the employment situation on the mobility process. The outcome of our attempt to measure structural characteristics is perhaps the less impressive. Further research with data that enable more precise measurement is needed, as is further theoretical work on the mechanisms through which the occupational structure may influence mobility.

The methodological objective was to develop a method of analysis of life histories that permits an efficient utilization of the wealth of information contained in such data. By using jobs and job shifts as units of analysis in the analysis of the transition process, and by using jobs weighted by their duration in the analysis of the achievement level, we have attempted to meet the methodological objective. This method of analysis should be of general usefulness in the analysis of life histories wherever the interest is in the occupancy and transition between discrete states, such as jobs, residences and the like.

Our analysis of life history data leaves some unresolved methodological problems. It is not known to what extent the statistical significance analysis is invalidated by the dependency of multiple observations on the same individual. Also our result is to an unknown degree influenced by errors of individuals' recall -- errors that influence the reliability of our data and possibly also their validity, if the information is systematically biased.

A specific methodological achievement has been the development of a mathematical model for the transformation of time that enables us to take the time-dependency in a transition rate into account. This model might be of importance in the analysis of change data, as the assumption of constant transition rates that is made in simple Markov processes often is untenable.

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Appendix A

The approximation log $(e^{\gamma d}-1) \simeq \log \gamma d$.

In chapter 3 we could use the equation (3.16) to estimate q_i directly using the value of γ obtained in Table 3.1. This approach has the weakness that the estimating equation (3.14) only includes age as an independent variable. Age is however not the only variable that affects the probability of leaving, and to the extent unmeasured variables are correlated with age our estimate of γ is biased. It was hence deemed advantageous to be able to use the model without à priori estimation of γ. To do this it is necessary to perform the approximation

$$\log (e^{\gamma d}-1) \simeq \log \gamma d.$$

If the exponential term on the left hand side is expanded, we obtain

$$e^{\gamma d} = 1 + \frac{\gamma d}{1!} + \frac{(\gamma d)^2}{2!} + \frac{(\gamma d)^3}{3!} + \ldots$$

It follows that the term may be written:

$$\log (e^{\gamma d}-1) = \log \left[\frac{\gamma d}{1!} + \frac{(\gamma d)^2}{2!} + \frac{(\gamma d)^3}{3!} + \ldots\right]$$

Discarding all but the first term we get

$$\log (e^{\gamma d}-1) \simeq \log \gamma d$$

This approximation is tested by plotting $\log \gamma d$ against $\log (e^{\gamma d}-1)$ for d taking the values $1 \leq d \leq 150$ and γ assumed to be .01, .006 and .001 respectively. The results are shown in Figures A.1, A.2 and A.3.

We estimate a γ of .006 in Table 3.1 and for our sample of jobs d has a mean of 36 months and a standard deviation of 57 months. The approximation therefore seems satisfactory for the range of values encountered here.

However as γ increases there is a departure from unity in the slope relating the two terms. This means that we should write

$$\log \gamma d = \alpha \log (e^{\gamma d}-1)$$

where α is less than 1. Since we substitute the left hand term for the true one in subsequent equations we introduce a bias in the estimation of the b_j's of equation (3.19). This will be a systematic bias that will produce an underestimation of the b_j's. However it should be recalled that also the use of the *à priori* estimated γ will lead to a bias. Since given the mean and standard deviation of d we do obtain a very nearly linear approximation within the range of values encountered, we prefer the approximation because of its computational simplicity.

It is possible to carry out another test of the approximation. We can compute the exact value of $\log (e^{\gamma d}-1)$, using γ from table 3.1 in chapter 3. Regressions with this quantity as the dependent variable can be compared to regressions performed with log d as the dependent variable. Table A.1 gives the comparison for all variables used as independent variables in chapter 3. Standardized regression coefficients are given since our concern is whether the approximation would affect inferences about the relative contributions of independent variables to the variation in the probability of leaving. It is clear from table A.1 that no major bias occurs.

Table A.1. Here

In table A.1 a value of γ of .006 is used. This is not the correct value since it is biased by the influence of variables correlated with age. Using the approximation we obtain a value of γ of .012 (see table 3.1). If we use this value of γ in the computation of log $(e^{\gamma d}-1)$, the results are unchanged. In fact the value of $\log(e^{\gamma d}-1)$ for a γ of .006 correlates .99 with the value of $\log(e^{\gamma d}-1)$ where γ is .012.

Table A.1

Summary of Regression of Probability of Leaving a Job on Occupational Achievement and Characteristics of the Job-Holder using Exact and Approximate Value of log $(e^{\gamma d}-1)$.

Independent Variable	Standardized Regression Coefficient log d	 log $(e^{\gamma d}-1)$
A. Returns:		
Prestige	-.096	-.087
Income	-.069	-.071
Income Adequacy	-.065	-.060
B. Resources:		
Race	.088	.078
Education	.064	.088
Verbal Ability	.042	.067
Martial Status	.039	.038
Labor-force Experience	.063	.057
Number of Siblings	-.027	-.027
Mother's Education	.027	-.024
Father's Prestige	-.007	-.012
Father's Education	.001	.006
C. Personal Constraints:		
Age	-.680	-.689
Ownership of House	-.059	-.061
Size of Household	-.017	-.026
D. Structural Conditions		
Calendar Year	.204	.215
R^2	.27	.27

N = 5980

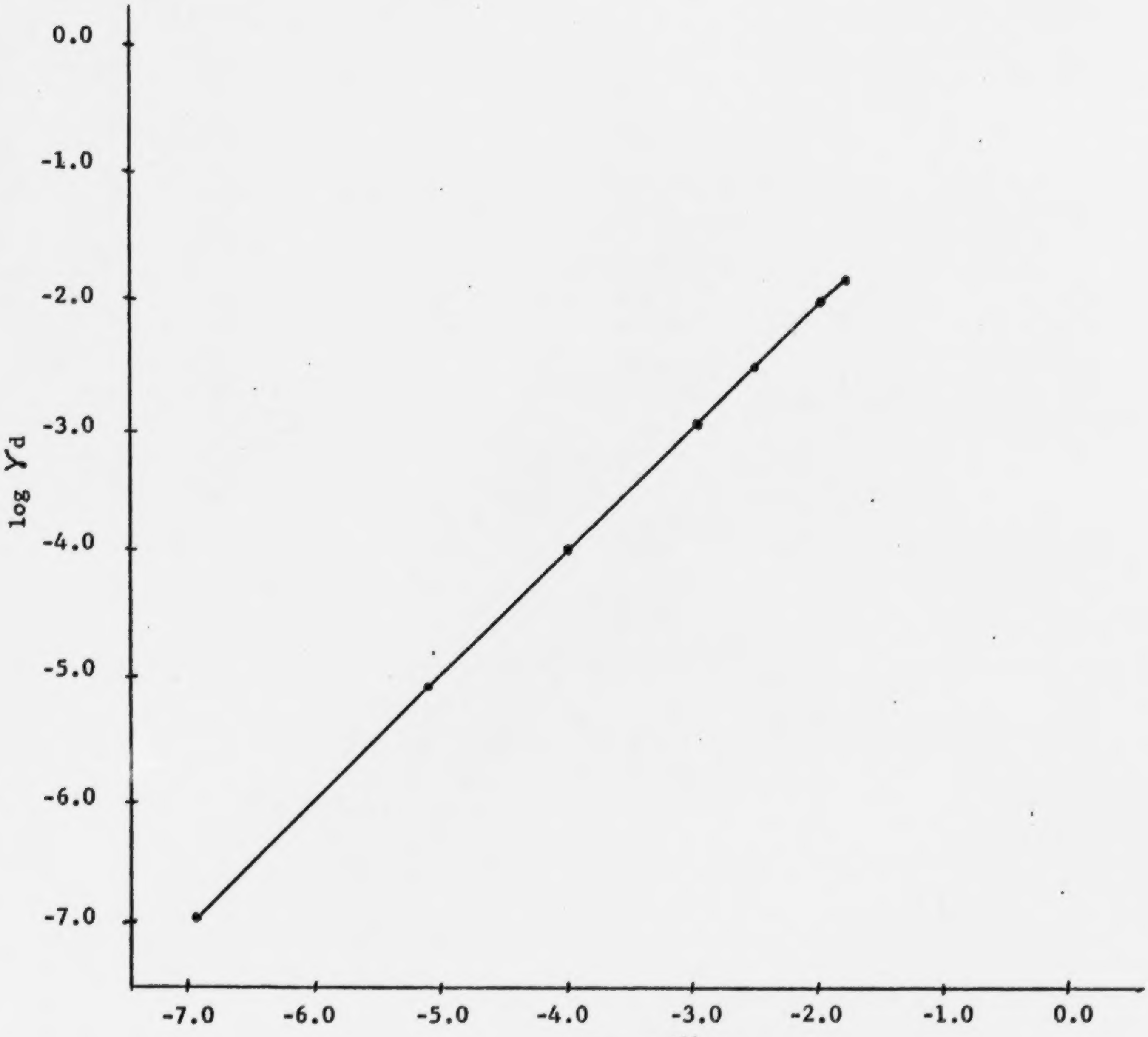

Fig. A.1. - Graph of the Relationship Between log γd and log $(e^{\gamma d}-1)$ for $\gamma = .001$.

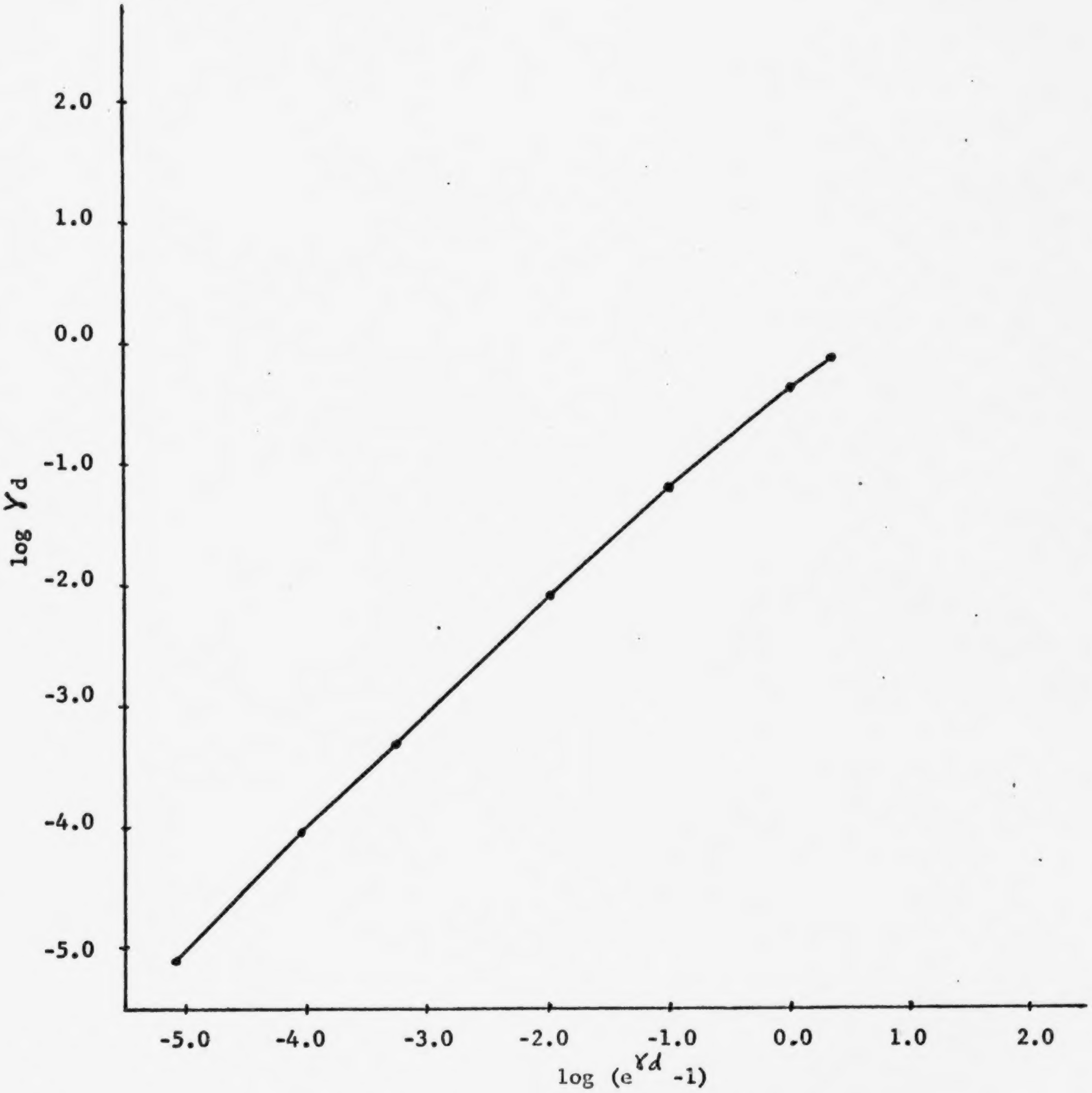

Fig. A.2. - Graph of the Relationship Between log γd and log ($e^{\gamma d}$-1) for γ = .006

A-6

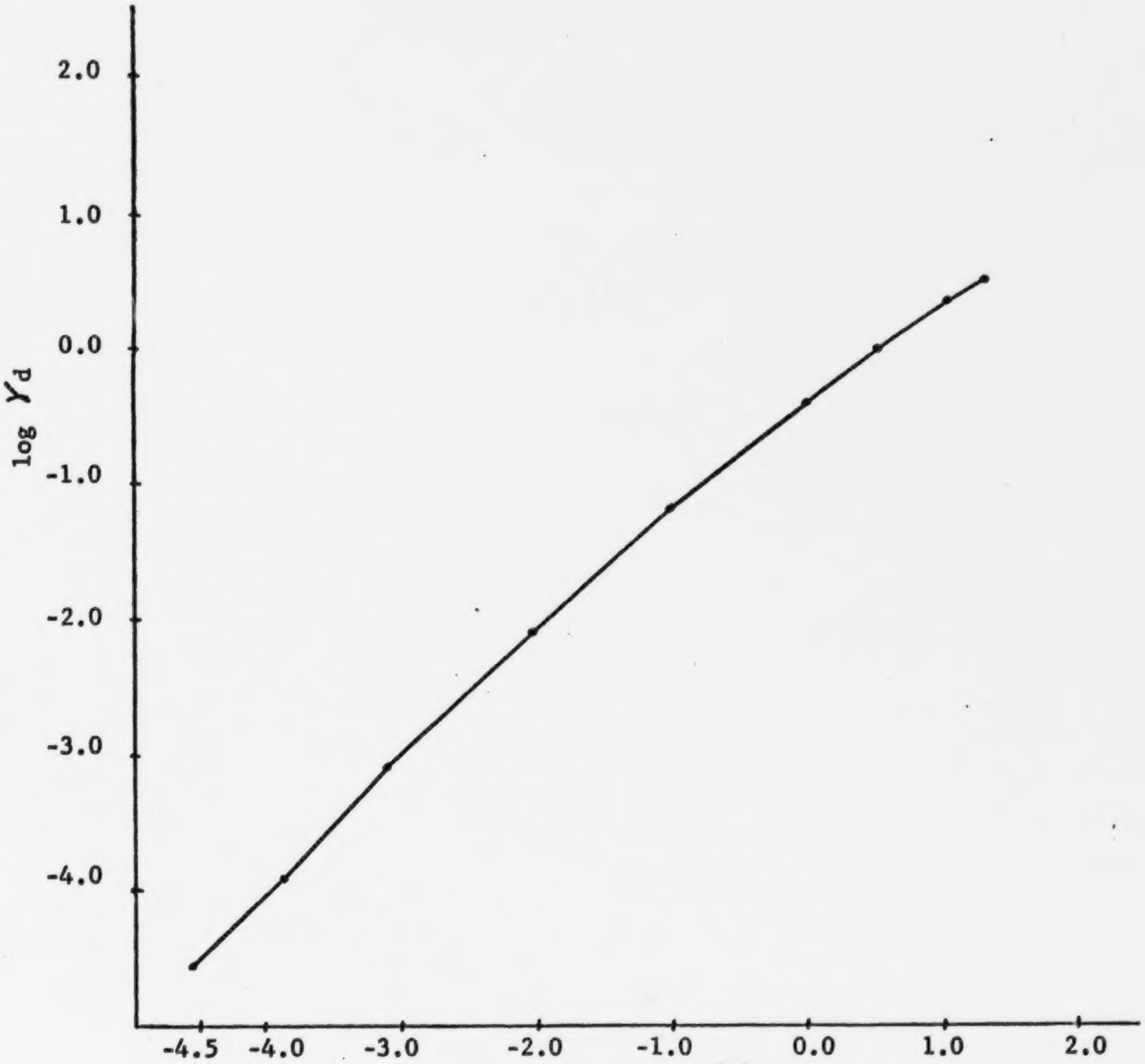

Fig. A.3. - Graph of the Relationship Between log γd and log ($e^{\gamma d}$-1) for $\gamma = .01$

A-7